BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2015-2016
Course Handout (Part II)

Date: 03/08/2014

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.   : **CHE F211**
Course Title   : **Chemical Process Calculations**
Instructor-in-charge   : SONAL MAZUMDER
Tutorial Instructor   : Priya C. Sande & Somesh Mishra

1. Scope & Objective of the Course:
This course introduces a student to the enchanting world of chemical Engineering. It is an endeavor to inculcate systematic problem solving skills in students. Material and energy balances are introduced, explained and worked with. The course deals with industrial problems and finds the solution using material and energy balance equations.

2. Text Book:
Himmelblau, D. M and Riggs, J.B. "Basic Principles and Calculations in Chemical Engineering", PHI, 7th ed., 2009.

3. Reference Book:
Felder, R. M. & R. W. Rousseau, "Elementary Principles of Chemical Processes", John Wiley & Sons, Inc., 3rd ed., 2000.

4. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Ref. (Text Book)
1	Introduction to Chemical Engineering	-	-
2	Units and Dimensions; Conversion of units	Units and Dimensions, Operations with units, Conversion of units and conversion factors	1.1, 1.2, 1.3
3	Dimensional consistency in equations; Concept of mole unit	Dimensional consistency, Mole unit,	1.4, 2.1
4	Definitions of density, specific gravity, flow rate, mole and mass fractions, Concentration	Density, specific gravity, mole fraction and mass fraction, concentration	2.2-2.5, 2.7
5	Choosing a Basis, Temperature, Pressure	Temperature and Pressure	3, 4, 5.1, 5.2, 5.3
6-8	Material Balances	Concept, Open Vs Closed, Steady Vs Unsteady state systems, Multi component systems, Systems involving chemical reactions, Problem solving strategy	6.1 to 6.6, 7
9	Material Balance for Single Unit	Material Balance Problems without Chemical Reaction	8
10-11	The Chemical Reaction Equation and Stoichiometry	Stoichiometry and Its Terminology	9.1, 9.2
12-13	Material Balances involving Chemical Reaction	Material Balance Problems with Chemical Reaction	10.1 to 10.3
14	Material balances involving multiple subsystems	Solving material balance problems involving multiple subsystems	11

15-18	Material balances with recycle, bypass and purge	Recycle bypass and purge calculations	12.1 to 12.5
19	Calculation procedures for ideal gas systems	Ideal gas law calculations, ideal gas mixtures and partial pressure	13.1 to 13.3
20-22	Vapor pressure and saturation, calculation of dew point	Phase diagram, vapor pressure estimation, saturation, condensation, vaporization	16.1, 16.2, 17.1 to 17.3
23-24	Definition of relative saturation, molal saturation, absolute saturation	Partial saturation and humidity	18.1, 18.2
25	General energy balances for open and closed systems	Terminology, Types of Energy	21.1, 21.2
26-28	Energy balances for processes without chemical reaction	Closed system (steady and unsteady), Open system (steady and unsteady)	22
29-30	Calculation of enthalpy changes using heat capacity equations and enthalpy tables, use of steam tables	Calculation of enthalpy changes	23.1 to 23.4
31-32	Enthalpy balances	Energy balances in the absence of chemical reactions	24.1 to 24.4
33-34	Energy balance with chemical reaction	Heat of formation, Heat of Reaction, heat of combustion	25.1 to 25.4
35-36	Solving simultaneous material and energy balances	Analyzing the degrees of freedom in a steady-state process, solving material and energy balances using flow sheeting codes	26.1, 26.2
37	Heats of solution and mixing	Heat of solution, dissolution and mixing	28.1, 28.2
38-40	Humidity chart and its use in determining the properties of moist air	Terminology, humidity chart	29.1 to 29.3

5. Evaluation Scheme:

Components	Duration	Weight age	Date & Time	Remarks
Mid Semester Test	90 min	90 (30%)	7/10 2:00 - 3:30 PM	CB
Tutorial Test$		60 (20%)	-	CB/OB
In-class Assignments$		20 (7/%)		
Comprehensive Examination	3 hours	130 (43%)	7/12 FN	CB/OB

$Tests will be surprise in nature. Best six performances (out of 8) for tutorial and four for in-class assignments will be counted for final grading. No make-up for any tests.

6. Make-up Policy:

Make-up will be granted only for genuine cases with valid justification and prior permission of Instructor-in-charge.

7. Chamber Consultation Hour:

To be announced in the class.

8. Notices:

Notices, if any, concerning the course will be displayed on the Chemical Engineering Department Notice Board, by Email and Intra Bits Portal.

Instructor-in-charge
CHE F211