SECOND SEMESTER 2015-16

Course Handout (Part II)

Date: 08/01/2016

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 F343**
Course Title	**: PROCESS DESIGN PRINCIPLES II**
Instructor-in-charge	**: DR. PRADIPTA CHATTOPADHYAY**
Other Instructors (Tutorial)	**: Dr. Smita Raghuvanshi, Mr. Subhajit Majumder**

Course Description: Review of process synthesis, Design and sizing of equipment of heat exchangers, separation towers, pumps etc. Cost accounting and capital cost estimation, Annual costs, earnings and profitability analysis, optimization of process flow sheets. Steps involved in designing configured industrial systems like solar desalinators, fuel cells, etc.

Scope and Objective of the Course:

The aim of the course is to provide fundamental knowledge of design aspects and economic analysis as applicable to Chemical Engineering processes. The main focus is on the concepts of process design with emphasis on cost estimation, profitability analysis, actual design of important equipments for Chemical Engineers.

Text Books:

T1 V. Mahajani & S. Umarji, "Joshi's Process Equipment Design", Macmillan Publishers India Ltd., 4th Ed., 2009.

Reference Books & Literature:

R1 M.S. Peters & K.D. Timmerhaus, Plant Design and Economics for Chemical Engineers, McGraw-Hill, 4th Edition, 1991.

R2 Coulson & Richardson, Chemical Engineering Design, Pergamon Press, Volume 6, 2nd edition, 1993.

R3 Aspentech online portal

R4 Chafik E., Design of plants for solar desalination using the multi-stage heating/humidifying technique, *Desalination* 168 (2004) 55-71.

R5 Luna-Sandoval G., et al., Hydrogen Fuel Cell Design And Manufacturing Process used for Public Transportation in Mexico City, Proceedings of WCE 2011, July 6-8, 2011, London, U.K.

R6 S.B. Thakore & B.I. Bhatt, Introduction to Process Engineering and Design, Mcgraw Hill Education (India) Pvt. Ltd., ISBN: 978-0-07-063415-2.

Course Plan:

Lect. No.	Learning Objectives	Chief topics to be covered	Ref. Chap./Sec.#(Book)
1-10	To understand the General Design Procedure, Case studies on important developments in process design	Introduction, Important aspects of process design, Basic Process Equipment, Materials of Construction, Corrosion and its prevention, Review of process flow sheets, Optimization of process flow sheets-principles, Case studies pertaining to design of configured industrial systems like solar desalinators, fuel cells	Ch. 1-1.1 to 1.5, Ch. 2-2.1, 2.3, 2.4, T1, R3, R4, R5
11-12	To understand the important concepts of cost estimation	Fixed capital, working capital, equipment cost, estimation of equipment cost by scaling, total product cost	Ch. 6, R1
13-14	To study the various concepts of interest, investment cost	Types of interest, compound interest, present worth and discount, annuities, perpetuities and capitalized costs	Ch. 7, R1
15-17	To study the important	Depreciation, types of depreciation,	Ch. 9, R1

	concepts of depreciation	salvage value, present value, methods for determining depreciation	
18-23	To understand the various aspects of profitability, alternative investments	Methods for profitability evaluation, alternative investments	Ch. 10, R1
		Mid Sem Exam	
24- 40	To study the important concepts of basic heat exchanger design, process design of piping, pumps, separation tower	Heat exchanger types, basic design procedure, shell and tube exchangers, tubes and tube arrangements, LMTD, methodology for design of pumps and piping, Study of a sieve tray tower design	Ch. 12, R2, Ch. 5-6, R6, Ch. 8, R6

Evaluation Scheme:

Component	Duration	Weightage (300)	Date & Time	Remarks
Mid-Sem Test	90 min	90	17/3 2:00 -3:30 PM	CB
Surprise Tests	15 mins for each	50	During tutorial session	CB
Assignment	-	40	-	OB
Comprehensive Exam	3 hours	120	7/5 FN	CB

Six surprise tests (each 10 marks) will be conducted out of which best five surprise tests and one assignment will be considered for final grading. During surprise tests the students will be asked to solve problems (numerical/short answer type) and submit the answer sheet to the instructor.

Chamber Consultation Hour: To be announced in the class.

Notice: Notice will be displayed on Chemical Engineering Notice Board as necessary.

Make up Policy:

- Make up exam for Mid-sem and Comprehensive exam will be granted **for genuine cases only**. Prior permission of IC is compulsory.
- **No Make up will be granted for Surprise Tests or Assignment**.

Instructor-in-charge

CHE F343