SECOND SEMESTER 2017-18

Course Handout (Part II)

Date: 08/01/2018

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)	**: Prof. Arvind K. Sharma**

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 W.D. Seider, J.D. Seader & D.R. Lewin, "Product & Process Design Principles", John Wiley & Sons, Inc., 2nd ed., 2004.

Reference Books & Literature:

R1 M.S. Peters, K.D. Timmerhaus & R.E. West, Plant Design and Economics for Chemical Engineers, McGraw- Hill, 5th Edition, 2011.

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.	Chief topics to be covered	Ref. Chap./Sec.#(Book)	Learning Outcome
1-10	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, Discussion on air coolers, fired heaters	Ch. 1, Ch. 3-T1, R3, R4, R5	Understanding the general design procedure, Case studies on important developments in process design
11-12	Fixed capital, working capital, equipment cost, estimation of equipment cost by scaling, total product cost	Ch. 6, R1	Understanding the important concepts of cost estimation
13-14	Types of interest, compound interest, present worth and discount, annuities, perpetuities and	Ch. 7, R1	Learning the various concepts of interest, investment

	capitalized costs		cost
15-17	Depreciation, types of depreciation, salvage value, present value, methods for determining depreciation	Ch. 7, R1	Learning the important concepts of depreciation
18-23	Methods for profitability evaluation, alternative investments	Ch. 8, R1	Understanding the various aspects of profitability, alternative investments
24- 40	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, Ch. 13-15-T1	Learning the important concepts of basic heat exchanger design, process design of piping, pumps, separation tower

Evaluation Scheme:

Component	Duration	Weightage (300)	Date & Time	Remarks
Mid-Sem Test	90 min	90	7/3 2:00 -3:30 PM	CB
Surprise Tests	15 mins for each	60	During tutorial session	CB/OB
Assignments	-	30	During lecture session	OB
Comprehensive Exam	3 hours	120	7/5 FN	CB

Eight surprise tests (each 10 marks) will be conducted out of which best six surprise tests and two assignments will be considered for final grading.

Chamber Consultation Hour: To be announced in the class.

Notice: Notice will be displayed on Chemical Engineering Notice Board/Nalanda 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 Assignments**.

Instructor-in-charge

CHE F343