



SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 16.01.2021

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 Principle II
Instructor-in-Charge : DR. PRADIPTA CHATTOPADHYAY
Instructor(s) : Dr. Pradipta Chattopadhyay, Linisha Biswal
Tutorial/Practical Instructors: Dr. Pradipta Chattopadhyay, Linisha Biswal

1. 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, hand warmers, etc.

2. 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.

3. Text Books:

T1 W.D. Seider, J.D. Seader & D.R. Lewin, “Product & Process Design Principles”, John Wiley & Sons, Inc., 2nd ed., 2004.

4. Reference Books:

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.



5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1-Overview/Case Studies on Latest Developments	1.1-1.6 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
2- Concepts related to Economics	2.1-2.2 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
	2.3-2.4 Types of interest, compound interest, present worth and discount, annuities, perpetuities and capitalized costs	Ch. 7, R1	Learning the various concepts of interest, investment cost
	2.5-2.7 Depreciation, types of depreciation, salvage value, present value, methods for determining depreciation	Ch. 7, R1	Learning the important concepts of depreciation
	2.8-2.13 Methods for profitability evaluation, alternative investments	Ch. 8, R1	Understanding the various aspects of profitability, alternative investments
3-Detailed Design	3.1- 3.21 Heat exchanger types, basic design procedure, shell and tube exchangers, tubes and tube arrangements, LMTD, methodology for design of pumps and piping, power required for blower and adiabatic compressor, process design of orifice meter, rotameter, 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, orifice meter, rotameter, separation tower



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6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 mins	30	To be announced later	OB
Comprehensive Examination	120 mins	40	To be announced later	OB
Tutorial Tests *	20 mins each	30	During Tutorial Session	OB

*** Eight Tutorial Tests will be conducted (best 6 will be considered).**

7. Chamber Consultation Hour: To be announced in the class.

8. Notices: Notice will be displayed in **Google Classroom/BITS email of student** as necessary.

9. Make-up Policy:

- A. Make up exam for **Mid-sem and Comprehensive exam** will be granted for genuine cases only. **Prior permission of IC is compulsory.**
- B. **No Make up** will be granted for any Tutorial Test missed.

10. Note (if any): None

Instructor-in-charge
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