



SECOND SEMESTER 2022-2023

Course Handout (Part II)

Date: 16/01/2023

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

Course No. : CHE F419
Course Title : Chemical Process Technology
Instructor-in-charge : Ramendra Kishor Pal

1. Scope and Objective of the Course:

The aim of the course is to study the general principles involved in Chemical manufacturing processes and their application to specific chemical industries relevant to the Indian economy. The course will provide detailed processing (from raw materials to products) of agrochemicals, chlor-alkali, petroleum, petrochemicals, coal-based industries, cement, synthetic polymers, paints & coating, pharmaceuticals, Li-ion batteries, green-H₂, and silicon production for microelectronics. Emphasis is placed on understanding the flow sheets and troubleshooting.

2. Learning Outcomes:

- Understand the Unit operations and Unit processes involved in Chemical process technologies
- Apply the knowledge of Separation processes 1 & 2 and Kinetics & Reactor Design in understating the chemical process
- Understand the Engineering problems in the processing of chemical products
- Understand the need for flow sheets in manufacturing a product (like fertilizers, Petroleum, and Paint)

3. Text Book-T1: "Dryden's **Outlines of Chemical Technology** for the 21st Century" Edited by M. Gopala Rao and Marshall Sittig. East West Press, 3rd Ed., Reprint 2010.

Reference Book

R1: Shreve's Chemical Process Industries by George T. Austin, McGraw Hill, 5th Edn., Reprint 2017

4. Course Plan:

Lect. No.	Learning Objectives	Topics to be covered	Ref. Chap./ Book
1	Overview of the course		
2	To know the present status of chemical industries in India	Classification of Chemical Industries Chemical Industries – Facts and figures	Ch-I A-B, T1 Class notes
3	Concepts of unit operations and unit processes. General Principles applied in Chemical Industries	Lab tour: Drying (Try drier), Filtration (rotary drum vacuum filtration), Sedimentation, Adsorption, Evaporation, Size reduction (fibres, particles), Size enlargement (Granulation)	Ch-I C-D, T1
4-8	To understand the Nitrogen-based fertilizers production	Urea Production Processes; Ammonium Nitrate and Nitrolime Production Process	Ch-II E, T1; R1
9-12	To understand the importance of NPK fertilizer and its production	Production of Phosphoric acid, Superphosphate and DAP	Ch-II F, T1; R1
13-14	To understand the cement manufacturing process	Cement properties, limestone beneficiation, Portland cement manufacturing	Ch-I IK, T1
15-18	To understand the crude oil	Origin and classification of petroleum; Refining	Ch-III H, T1;



	refining processes	operations (atmospheric and vacuum distillation), Catalytic cracking, Reforming	R1
19-20	To understand the petrochemical processes	Chemicals from C ₁ compounds, Chemicals from C ₂ compounds (Ethylene and acetylene production)	Ch-IV B-D, T1; R1
21-23	To understand the processes in polymer technology (thermoplastics and thermosets including fibres)	Modes of Polymerization, Structure-properties of polymers, Processing of polyolefins (PE), PVC, Phenol-formaldehyde and Epoxy resins. Production of viscose, Nylon, Polyester and Carbon fibres.	Ch-V A-B, T1, R1, notes
24-25	Chlor-Alkali Industries	Soda Ash, Sodium hydroxide, Chlorine	Ch-II H, T1, R1
26-27	To understand the coal-based technologies	Coking of coal, Coal gasification, Hydrogenation of Coal, Ash	Ch-III G, T1; R1
28-34	Paints and Coatings	Dispersions, resins, additives in Paints, varnishes, powder coat, EMI shield, Coating failure	Ch-III C, T1, R1 Class notes
35-36	Energy Industries	Production of Li-ion batteries and Green- H ₂	Class notes
37-39	Pharmaceutical Industry	Development and Manufacture of API, Manufacture of paracetamol tablets, Manufacture of flu vaccine	Ch-IV H, T1, R1, Class notes
40	Production of Silicon wafers for microelectronics	Silicon production, crystal growth, and Basic steps of wafer production	Class notes

5. Evaluation Scheme:

Evaluation Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-semester test	90 min	25%	17/03 4.00 - 5.30PM	CB
Quizzes (2 best of 3)	40 min	15%	TBA	OB
Project Seminar		20%	TBA	OB
Comprehensive Exam	3 hours	40%	18/05 AN	CB

NOTE: A total of three quizzes will be conducted. Two best of three will be considered.

6. **Chamber Consultation Hour:** To be announced in the class. (**Chamber: D 321**)

7. **Notice:** Notice will be displayed on CMS

Make-up policy: No make-up for the quizzes in any case. Make-up for the mid-semester test and comprehensive exam may be granted only if **the student maintains a minimum of 50% attendance in class** and has genuine reasons not to appear in the regular test. Prior permission from IC is a must for any make-up.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
Dr. Ramendra Kishor Pal
CHE-F41 (Chemical Process Technology)