

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

Hyderabad Campus

SECOND SEMESTER 2021-2022

Course Handout (Part II)

Date:
15/01/2022

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 F419
Course Title : Chemical Process Technology
Instructor-in-charge : Ramesh Adusumalli

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 Indian economy. Process technology of Vegetable oils, Fertilizers, Pulp & Paper, Cement, Coal, Petroleum, Synthetic polymer and Fibres will be studied in detail i.e. raw material to product. Emphasis is placed on understanding the flow sheets.

2. Learning Outcomes:

- Understand the Unit operations and Unit processes involved in Chemical process technologies
- Apply the knowledge of Separation processes-1&2 and Reaction Engineering in understating the chemical process
- Understand the Engineering problems in processing of chemical products
- Understand the need for flow sheets in manufacturing a product (like cement or paper)

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 | Chapter in the Text Book |
|-----------|--|---|--------------------------|
| 1. | Overview of the course | | |
| 2 | To know the present status of chemical industries in India | Chemical Industries – Facts and figures | Ch.IA-B, T1 |
| 3 -4 | To understand the Unit operations | Lab tour: Drying (Try drier), Filtration (rotary drum vacuum filtration), | Ch.IC-D, T1 |

| | | | |
|-------|--|--|------------------------|
| | | Sedimentation, Adsorption, Evaporation, Size reduction (fibres, particles), Size enlargement (Granulation) | |
| 5-6 | To understand the cement manufacturing process | Cement properties, limestone beneficiation, Portland cement manufacturing | ChIIK, T1 |
| 7 | To understand the sulfuric acid production process | Contact Process using SO ₂ and air | ChII A, T1; R1 |
| 8-9 | To understand the Nitrogen based fertilizers production | Urea Production Processes; Ammonium Nitrate and Nitrolime Production Process | ChII E, T1; R1 |
| 10-12 | To understand the importance of NPK fertilizer and its production | Production of Phosphoric acid, Superphosphate and DAP | ChII F, T1; R1 |
| 13-15 | To understand the extraction of edible oils | Mechanical and solvent based extraction processes, Hydrogenation of vegetable oils, continuous process for Soap manufacturing. Gas chromatography of vegetable oils | ChIII A, B, T1; R1 |
| 16-20 | To understand the pulp and paper production processes | Cellulose raw materials used for pulp production, Mechanical Pulping; Kraft (sulfate) Process; Chemical recovery, Paper making, Production of lignin chemicals; Production of recycled paper, MDF boards and Nanocellulose | ChIII F, T1; R1, notes |
| 21-23 | To understand the coal based technologies | Coking of coal, Coal gasification, Hydrogenation of Coal, Ash | ChIII G, T1; |
| 24-26 | To understand the crude oil refining processes | Origin and classification of petroleum;; Refining operations (atmospheric and vacuum distillation), Catalytic cracking, Reforming | ChIII H, T1; |
| 27-31 | To understand the petrochemical processes | Chemicals from C ₁ compounds, Chemicals from C ₂ compounds (Ethylene and acetylene production) | ChIV B-D, T1; |
| 32-37 | 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. | ChV A-B, T1, R1, notes |
| 38-39 | To understand the aluminium manufacturing processes | Purification of alumina from Bauxite, electrolytic aluminium smelting cell. | ChVI B, T1; |
| 40 | To understand the Paracetamol Tablet manufacturing | API, binder, granulation, Tablet making and Tablet attributes. | Class notes |
| 41 | Recent trends in Processing | Machine Learning in Chemical Engineering | Class notes |

5. Evaluation Scheme:

| Evaluation Component | Duration | Weightage (%) | Date & Time | Nature of Component |
|----------------------|----------|---------------|--------------------------------|---------------------|
| Mid semester test | 90 min | 35% | 10/03 11.00am to 12.30pm | OB |
| Surprise Tests (2) | 30 min | 10 % | | OB |
| Seminar | | 20 % | | OB |
| Comprehensive Exam | 2 hours | 35% | 06/05 AN | CB/OB |

NOTE-1: Seminar topics will be allotted **for students having 20 % attendance in the class.**

NOTE-2: Mode of conducting comprehensive exam (CB/OB) will be announced 1 month prior to exam.

NOTE-3: Total two surprise tests will be conducted and average will be considered for 10 % weightage

6. **Chamber Consultation Hour:** To be announced in the class. **(chamber: D 207)**

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

Make-up policy: Make-up will be granted after **he /she maintains 50% attendance in the class** and has genuine reasons not to appear in the regular test. Prior permission from IC is 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
Adusumalli

Prof. Ramesh

CHE F419
(Chemical Process Techn