

Educational Objectives:

1. The course is concerned with the chemical processing of carbon-based (organic) raw materials into useful and profitable products. The products are used both as consumer goods and as intermediates for further chemical and physical modification to yield consumer products. It emphasizes chemical conversions or reactions that are applicable to industrial processing. In essence, it considers the basic chemistry of the raw materials along with some discussion of the equipment in which reactions take place. Consideration is also given to the costs of reaction materials, energy consumption in the process and the effect of efficiency. Throughout the course there is extensive use of flowsheets to demonstrate in simple terms, how transformation of the raw materials takes place.

Course Outcomes:

2. Upon completion of this course students will be able to:
- a. Demonstrate a foundational knowledge of general inorganic and organic chemistry principles and concepts and be able to apply this knowledge to the solution of problems and performance of experiments.
 - b. Demonstrate a basic understanding of analytical and instrumental concepts and techniques and develop complementary practical laboratory skills related to the science of chemistry.
 - c. Analyze the flow of raw material to product formation quantitatively and qualitatively in each step of processes.
 - d. Organize and prepare process flow diagrams.
 - e. Apply the concepts of unit operation and unit processes that are employed in design of process plants.

- f. Analyze the upstream and downstream processes that are encountered in manufacturing process.
- g. Analyze nuclear raw material separation and preparation of nuclear fuels.
- h. Effectively collect, interpret, evaluate and communicate scientific data in multiple formats using computer technology as needed.

3. **Course Contents:**

- a. The need for the chemical industry, technology and changes.
- b. Raw materials acquisition and processing.
- c. Concept of unit operations and unit processes; process representation using flow sheets
- d. Costs and energy considerations as well as efficiency of operation.
- e. Petroleum and petroleum products
- f. Constituents of petroleum
- g. Common refinery fractions
- h. Refining process
- i. Petrochemical and manufacturing processes.
- j. Sugar and starch industries
- k. Manufacture and uses
- l. Energy requirements.
- m. Aspects of process integration.
- n. Starch and related products.
- o. Food and food by-products
- p. Food science and technology
- q. Preservation of food.
- r. Food manufacturing industries
- s. Types of food processing
- t. Packaging in food processing
- u. Food by products
- v. Food processing equipments.

- w. Agrochemical Industries
- x. Pesticides, herbicides, plant nutrients and regulators.
- y. Oils, fats and waxes
- z. Vegetable oils – extraction and processing
- aa. Animal fats and oils.
- bb. Waxes
- cc. Soap and detergents
- dd. Uses (domestic and industrial)
- ee. Manufacture of soaps and detergents (raw materials, process flow sheeting)
- ff. By products of manufacturing process
- gg. Pulp and paper Industries
- hh. Manufacture of pulp
- ii. Manufacture of paper
- jj. Rubber and plastic industries
- kk. Raw materials
- ll. Manufacturing processes
- mm. Rubber compounding
- nn. Manufacturing process of plastics.
- oo. Synthetic fibres
- pp. Manmade fibres
- qq. Cellulosic and carbon fibres
- rr. Textile finishing and dying.
- ss. Fragrances, flavours and food additives
- tt. Perfume Industry
- uu. Favouring Industry
- vv. Food additives
- ww. Surface Coating
- xx. Paints
- yy. Pigments
- zz. Varnishes & Industrial Coatings

Recommended Books:

1. Organic Chemicals in the Environment: Mechanisms of Degradation and Transformation Second Edition Alasdair H. Neilson , Ann-Sofie Allard 2012
2. Organic Coatings: Science and Technology by Zeno W. Wicks, Frank N. Jones, S. Peter Pappas and Douglas A. Wicks. Wiley. 2007
3. Thermochemical Processing of Biomass: Conversion into Fuels, Chemicals and Power by Robert C. Brown. Wiley series. 2011