

FOUR YEAR UNDER GRADUATE PROGRAMME (FYUGP)
B.SC. IN CHEMISTRY PROGRAM (NEP)
DETAILED SYLLABUS OF 3rd SEMESTER

Title of the Course	:Industrial Chemistry of Petrochemicals and Polymer Products
CourseCode	:SEC336
Nature of the Course	:SKILL ENHANCEMENT COURSE
Total Credits	3
Distribution of Marks	:60 (End Semester) 40 (In-Semester)

COURSE OBJECTIVES:

- The primary objective of this paper is to help the student to develop awareness and appreciation for the significant role played by petrochemical and polymer industry in current societal and global issues.
- The students will be able to gain knowledge of fundamentals of petrochemical and polymer industry with enhanced command over scientific methods, techniques and chemical processes equipped with environment safety measures.
- This paper will give a glimpse of petrochemical and polymer industry to the students and help them to choose their career in the field of petrochemical and polymer chemistry.

UNITS	CONTENTS	L	T	P	Total Hours
<p>I (15 Marks)</p>	<p><i>Petrochemical Industry:</i></p> <p>History and Importance of Petrochemical Industry, growth in India, classification of petrochemicals, feedstock of the petrochemicals, Preparation of Feed stock from ethane/ propane and naphtha/ gas oil cracking, syn gas.</p> <p>Petrochemicals from C1, C2, C3, C4, syngas and aromatics</p> <p>Chemistry and technology for the production of methanol, formal dehyde, ethylene oxide, butene and cumene</p> <p>Chemical reactions of hydrocarbons like decomposition (thermal and catalytic)</p> <p>Properties of crude oil, octane number. Distillation (Atmospheric and vacuum distillation), petroleum products and their quality control tests.</p> <p>Value addition of petrochemicals: from feed stock to consumer end products.</p> <p>Gaseous Fuels: Natural gas, Synthetic gas; their composition and properties. Producer gas, water gas, Coal gas, LPG, CNG and Hydrogen as fuel.</p>	12	0	-	12

<p style="text-align: center;">II (20 Marks)</p>	<p><i>Polymer Chemistry:</i></p> <p>Brief history of macro molecular science, basic concept of polymers, general characteristics of polymer and vcomparison with common organic compounds.</p> <p>Classification of polymers on the basis of structures and applications. Natural and synthetic polymers, organic & inorganic polymers, thermoplastics & thermosetting polymers.</p> <p>Molecular Weight of polymers, Number average, weight average. Types of polymerizations – addition, condensation, mechanism of polymerization–freeradical, ionic (anionic and cationic), co-ordination polymerization, initiators, inhibitors.</p> <p>Chemistry of commercial polymers- General methods of preparation, properties and uses of the following - Teflon, polyethylene, polypropylene, polystyrene, polyesters, poly amides, polycarbonates and PVC.</p> <p>Phenol formal dehyde resins (Bakelite, Novolac), polyurethanes, polydienes, polycarbonates, conducting polymers, [poly acetylene, polyaniline, poly (p-phenylene sulphide), polypyrrole, polythiophene].</p> <p>Advances in polymers; Bio-Polymers, biomaterials, polymer in gas medical field, High temperature and fire resistant polymers – Silicones.</p>	13	0	-	13
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<p>III (10 Marks)</p>	<p><i>Chemical Safety and Ethical Handling of Chemicals:</i></p> <p>Safe working practices and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation. Safe storage and use of hazardous chemicals,</p> <p>Flammable or explosive hazards, Procedures for working with hazardous substances, Procedures for working with gases at pressures above or below atmospheric level.</p> <p>Safe storage and disposal of waste chemicals. Recovery, recycling and reuse of laboratory chemicals. Procedure for laboratory disposal of explosives. Identification, verification and segregation of laboratory waste. Disposal of chemicals in the sanitary sewer system. Incineration and transportation of hazardous chemicals.</p>	7	0	-	7
<p>IV (15 Marks)</p>	<p><i>Anyone experiment:</i></p> <p>(i) Determination of saponification value of petroleum sample.</p> <p>(ii) Determination of density of fuel sample.</p> <p>(iii) Preparation of urea-formaldehyde resin.</p> <p>(iv) Preparations of novolac resin/resol resin.</p> <p>(v) Determination of molecular weight of different polymers in water by viscometry.</p>	0	0	32	32
Total		32	0	32	64

Where, *L: Lectures* *T:Tutorials* *P:Practicals*

MODES OF FIN-SEMESTER ASSESSMENT: (40 Marks)

Two Internal Examinations- (20 Marks)

Others (Anyone)- (seminar / HA—etc) (20 Marks)

- Sessional Examination

- Assignment

COURSE OUTCOMES: (C.O)

By the end of this course, students will be able to:

- Understand the relevance of petrochemical industry and get in-depth knowledge of petroleum industries in India.
- Understand the basic petrochemical feed stocks and recognize the primary raw materials for various petrochemicals.
- Understand the role of hydrocarbons as starting materials for manufacture of various petrochemicals, feedstock, and consumer commodities.
- Learn various test methods used to qualify different types of petrochemicals.
- Know about the history of polymeric materials and their classification
- Learn about different mechanisms of polymerization, properties and applications of various useful polymers in our daily life.
- Evaluate environmental issues pertaining to the chemical industry and get familiar with the safe working practices in chemistry laboratory.

SUGGESTED READINGS:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. N. B. Singh, S. S. Das, An Introduction to Polymer science and Technology, New Age Internal Publisher, New Delhi
3. F. W. Billmeyer, Text book of Polymer Science, John Wiley & Sons, New York
4. B. K. Sharma, Polymer Chemistry, Goel Publishing House
5. J. A. Kent: Riegel's Hand book of Industrial Chemistry, CBS Publishers, New Delhi.
6. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.