

## PRPC2001 PETROCHEMICAL ENGINEERING (3-0-0)

### **Module I: (08hrs)**

#### **Origin and Composition of Petroleum**

Occurrence, Theories of formation, reserves deposits in world & Gas scenario in India, Refineries in India, Estimation of energy reserves. Composition of petroleum & Their structures, sulphur, nitrogen, oxygen & metal organic compounds in petroleum.

### **Module II: (07hrs)**

#### **Evaluation of Petroleum**

Classification of petroleum- Paraffinic base, Mixed base & Naphthalnic base, UOP characterization factor, Correlation index, Distillation characteristics, true Boiling Point apparatus, Avg. Boiling point Thermal properties of petroleum fractions- Heat of combustion, Latent heat of Vaporization, Latent heat of fusion, Thermal expansion, Spontaneous ignition temperature, V.I

### **Module III: (10 hrs)**

#### **Important petroleum Fractions**

1. Gases-its types & testing, 2. Gasoline- its types & testing (ASTM) distillation, RVP Octane no, Sulphur content), 3. Gasoline additives – detergents, Corrosion & Oxidation inhibitors, Combustion aids, Anti knocking, Dyes, 4. Aviation turbine fuels, jet fuels specification, Naphthas, 5. Kerosene- (Testing-Flash pt & Smoke point, Volatility, Sulphur content, Aniline point), 6 Diesel fuels- Classification, Specification, Pour pt, Aniline pt, Flash pt CV, Viscosity, Diesel additives, 7. Lube Oils- Composition, Classification- machine & oils, Turbine oils, Transformers oils etc.

### **Module IV: (10hrs)**

#### **Petrochemicals**

Introduction, Development of Petrochemical industry in India, Sources of Petrochemicals and Classification of petrochemicals- I Generation; Study of preparations & derivatives obtained from methane ethane, propane, ethylene Propylene, butylenes, acetylenes, butadiene aromatics, BTX etc. II Generation; products & derivatives obtained from styrene, dimethyl terephthalate, acrylonitrile, ethylene glycol, vinyl chloride, adipic acid, isopropyl alcohol, ethanol (shell process) acetone etc. III Generation: Products obtained from Polystyrene, PVC, DDT azodyes, PE, PP, polyesters, Synthetic fibers, synthetic detergents, Pesticides from petroleum, petroleum protein, Explosives from petroleum.

### **Module V: (10hrs)**

#### **Crude distillation & Treatment of Petroleum Fractions**

Impurities in Crude oil, desalting of crude oils, Atmospheric distillation of crude, Vacuum distillation of crude oil. Physical – mechanical- chemical impurities, Sweetening of petroleum by- Physical extraction, oxidizing mercaptans to disulphides, destruction of sulphur bearing compounds Catalytic conversions in presence of Hydrogen, Treatment of LPG, Gasoline treatment- copper chloride process, Inhibitor sweetening, Caustic & methanol treatment Lead doctoring, Merox sweetening, Sulphuric acid treatment, desulphurization, kerosene treatment – Liquid SO<sub>2</sub> Extraction of aromatics Lube treatment – Sulphuric acid treatment, Clay treatment Solvent treatment.

#### **Course Outcomes (COs)**

Upon successful completion of this course, students will be able to:

- CO1 Explain the origin, composition, and theories of petroleum formation, and evaluate energy reserves with a focus on global and Indian contexts.
- CO2 Classify different types of petroleum based on composition and properties, and calculate characterization factors such as UOP and Correlation Index.
- CO3 Analyze the properties and testing methodologies of key petroleum fractions, including gases, gasoline, aviation fuels, kerosene, diesel, and lube oils.
- CO4 Examine the development and classification of petrochemical products across multiple generations and describe their preparation and derivatives.

- CO5 Evaluate crude oil distillation processes, including desalting, atmospheric and vacuum distillation, and the treatment of petroleum fractions for impurities removal.
- CO6 Recommend suitable treatment methods for various petroleum fractions, such as sweetening processes, desulfurization, and catalytic conversions.

**Books:**

1. J.H.Gary, and G.E.Handwerk, Petroleum Refining: Technology and Economics. 3rd edition, Marcel Dekker Inc. 1994
2. J.H.Speight, The chemistry and technology of Petroleum Hydrocarbon, 3rd edition.
3. G.N.Sarkar, Advance Petroleum Refining, Khanna Publishers, 1998.