

ELECTIVE

TOT-011: PETROLEUM AND ITS PRODUCTS

L : T: P
3 : 1: 0

Unit I

Introduction to mineral oils, their origin and mode of occurrence. Oil resources and refineries in India. Composition of petroleum, Refinery products and their test methods. Evaluation of oil stocks introduction to processing of petroleum; general processing & crude distillation, refinery products and their applications, natural gas, gasoline, naphtha kerosene, fuel oils and gas oils, petroleum waxes, lubricating oils, tar and asphalt. 08

Unit II

Petroleum refining processes and operation: Thermal cracking, catalytic cracking, hydro-forming, catalytic reforming, alkylation, polymerization, isomerisation and other auxiliary process e.g. vis-breaking, de-waxing and de-asphalting operations. Manufacture of paraffin wax and microcrystalline waxes. 08

Unit III

Introduction to lubricants :Liquid , Solid and gas lubricants and their applications. Lubricating oils : Liquid mineral lubricants ,Synthetic liquid lubricants.Physical properties ,additives , manufacture of lubricating oils. Analysis of lubricating oils. 08

Unit IV

Lubricating Greases: Properties, types, ingredients, additives, analysis of lubricating greases as per BIS test methods. Manufacture of lubricating Greases-Processes and equipments. 08

Unit V

Introduction to petrochemicals; manufacture of alkyl aryl compounds, ethylene oxide condensation products benzene, toluene, xylene, buta-di-enes, vinyl chloride and styrene etc. 08

Reference Book

1. Petroleum Products Hand Book By V. B. Guthrie

TOT-012 PACKAGING OF OILS ,FATS AND ALLIED PRODUCTS

L : T: P
3 : 1: 0

Unit I

Introduction to packaging, elements of packaging, scopes and functions of a package. Materials used for packing: paper and paperboards; films and foils; glassware; metals plastics; wood; miscellaneous other materials; effect of environmental conditions on packing materials. 08

Unit II

Forms of packaging: folded cartons/boxes; corrugated board boxes, metal containers bags and envelopes, aerosols. Tubes, cans and molded plastic forms etc. 08

Unit III

Requirements of packaging surfaces for oils and allied products viz. Compatibility with the material to be packed printing and other miscellaneous requirements of a package. 08

Unit IV

Printing of packaging surfaces, requirements of Printing and evaluation of printed surfaces. Coatings and laminations of the packaging surfaces, types and properties of coatings and limitations. 08

Unit V

Packing of various products viz. Oils and fats, soaps and detergents; cosmetics; petrochemicals, wax and wax products; essential oils and perfumes; lubricating oils and greases; by products of oils, soaps and allied industries. Criteria and selection of packing material for different products. 08

TOT-013: TECHNOLOGICAL ADVANCES IN PERFUMERY AND COSMETICS

L : T: P
3 : 1: 0

Unit I

Fragrance –raw materials. Plant Oils : Essential Oil , Flower Oil, Resin and gum exudation. Animal secretions. Chemical substance –isolates (Plant , derivatives of plant materials ,synthetic organic substances. 09

Unit II

Raw materials for essential oils , newer extraction technologies of essential oils, Supercritical extraction ,HFC extraction ,Bio extraction etc. Instrumental analytical techniques of analysis of essential oils. 09

Unit III

Facial makeup : Creams, Cleansing ,emollient , hand and hormones Cream/lotions , foundation makeup , lipstick , sunscreen preparations. 08

Unit IV

Hair Preparations : Skin anatomy, raw materials for their selection ,additives etc.for hair dyes ,Bleaches , Hair coloring ,Hair grooming preparations. Hair Care : Shampoos ,Shaving soaps and creams, preshave and aftershave preparation. 09

Unit V

Herbal Cosmetic preparations; Chemical components of herbs & its extraction, Application of herbs & its extracts, Application of herbs in cosmetics and preservation; Advantages in perfumery: Notes of perfume, compatibility of perfume , fixation and stability of perfume ; analysis of perfumes, Medicinal applications of herbal and other essential oils & perfumes. 05

TOT-014: ENVIRONMENTAL ASPECTS IN OILS AND ALLIED INDUSTRIES

**L : T: P
3 : 1: 0**

Unit I

Industrial pollution and its impact . Magnitude of industrial waste , Legislative regulations. Recycle and reuse of waste water , recovery of by/c0-product from industrial effluents. 08

Unit II

Philosophy of waste treatment, scope of air and water pollution problems, economic considerations of waste disposal, separation and segregation of wastes, gaseous, liquid and solid waste disposal with special reference to oils and allied product processing. 08

Unit III

Waste Management Pollution prevention and environment Management system ISO 14000. Waste audit, Quality management systems, Different regulation means & acts for air , water& solid pollution control. 06

Unit IV

WASTE LIQUID TREATMENT:

Pretreatment methods, centrifugation filtration, evaporator and concentrator , extraction and distillation, treatment of dilute waste water. Treatment requirements, Neutralisation liquid-solid separation, biological oxidation, plant control programme, absorption, liquid phase system, reclamation of waste water effluent and by-product recovery, ion exchange system, acid and alkali purification, continuous ion-exchange,. Case studies on vegetable oil processing, soaps and detergents. 10

Unit V

WASTE GAS TREATMENT:

Air pollution control by mechanical method: mechanical collectors, electrostatic precipitator, filters,wet scrubbers, vapour phase system, activated carbon. Typical air purification system. 08

TOT-801: ADVANCED QUALITY CONTROL TECHNIQUES

**L : T: P
3 : 1: 0**

Unit -I

Importance of Quality control & Quality assurances, Techniques of separation of glycerides and fatty acids: Liquid – liquid extraction; distillation; low temperature crystallization; separation as lead and lithium soaps, urea complexes etc. 8

Unit -II

Application of chromatographic techniques in the quality control and quality assurance of oils, fats and products Chromatography: History, theoretical developments and various techniques e.g., thin layer chromatography,

column chromatography, gas-liquid chromatography, and HPLC; their principles, practices and applications to the analysis of oils and allied products. 8

Unit –III

Spectral methods of application; Ultra-violet, visible, infrared and near infrared spectroscopy techniques: principles, practices and application to the analysis of oils and allied products. Nuclear magnetic resonance spectroscopy: principle ,high resolution spectra of fats and fatty acids, adsorption of special groups, analysis of spectra and quantitative applications. 8

Unit -IV

Applications of semi-permeable membranes in the analysis of oils and allied products. Applications of TLC-FID analyzer, GC-MS, SFC-GCLC-MS in analysis of oils and fats. 8

Unit -V

Special quality control methods applied to oils, fats and allied industry e.g., nickel content of hydrogenated oils; iron and phosphatide content of crude and refined vegetable oils; wax content of vegetable oils; amino acid analysis by chemical and instrumental method etc. 8

Reference Book

TOT-802 ADVANCED OIL CHEMISTRY AND OLEO CHEMICALS

L : T: P
3 : 1: 0

Unit-I

Advanced theories of glyceride structure of natural fats, determination of glyceride structure; synthesis of glycerides; estimation of mono-, di-, and tri-glycerides. Stereo-specific analysis, lipase hydrolysis. Polymorphism of fats and fatty acids. Chemical synthesis of fatty acids and their derivatives. 08

Unit-II

Mechanism and industrial utilization of important chemical and biochemical reactions of fats and fatty acids; esterification, inter-esterification, isomerisation, polymerization, dehydration, pyrolysis and oxidation. Fatty acid esters and other oleo-chemicals derived from fats and fatty acids, products and by-products from castor oil, soyabean oil , rapeseed oil ,neem oil ,mahua , cottonseed etc., Stabilization of distilled fatty acids. 08

Unit-III

Fatty alcohols and amines: Methods of production and their utilization. Manufacture of sulphited and sulphurised oils ,properties , specifications and plant and processes employed. Textile auxiliaries, Leather chemicals , Polymer additives , Paint additives , Lubricant additives. 06

Unit-IV

Chemistry of drying oils: Modification of oils for surface coating industry. Thermal and chemical modification methods; properties of modified oils ,changes in drying oils during heat bodying and oxidative polymerization. Processes and plants employed for their commercial production. Malenised oils, epoxidised oils ,boiled oils , blown oils ,stand oils , urethane oils. 10

Unit-V

Fatty acids, distillation, crystallization , Fractionation, High purity fatty acid products blends distillation. 10

Reference Book

1. Fatty Acids Vol.- I –V by K. S. Markley
2. Bailey's Industrial Oil and Fat, Part--I -V By Bailey

TOT-803: BIO-TECHNOLOGY OF OILS AND FATS

L : T: P
3 : 1: 0

Unit -I

General aspects of enzymes.

Bio Processing of Oils: Bio degumming , Bio deacidification ,Bio leaching. 08

Unit -I

Bio-interesterification: Chemistry and technology of bio-interesterification, Detection of interesterified fats , Comparison of interesterified fats . 08

Unit -III

Application of Bio-interesterification ,Structured Lipids , Margarine and Shortening ,Production of plastic fats , Cocoa butter substitute ,Food emulsions ,Medicinal applications ,Preparation of polyol and other esters. 08

Unit -IV

Production of Oleo chemicals through biotechnological route. 08

Unit -V

General modification of oil bearing materials: Canola (rapeseed) , Linola (flax) ,High Oleic sunflower ,Low-linloenic soyabean ,Low-linolenic canola. 08

TCH-806: INDUSTRIAL SAFETY AND HAZARD MANAGEMENT

L : T: P

3 : 1: 0

Unit I

Industrial safety, Industrial hygiene and safety aspects related to toxicity, noise, pressure, temperature, vibrations, radiation etc. Explosions including dust , vapor, cloud and mist explosion. 06

Unit II

Elements of safety, safety aspects related to site, plant layout, process development and design stages, identification of hazards and its estimation, risk, risk analysis and assessment methods; fault free method, event free method, scope of risk assessment, controlling toxic chemicals and flammable materials. 10

Unit III

Toxic substances and degree of toxicity, its estimation, their entry routes into human system, their doses and responses, control techniques for toxic substances exposure, use of respirators, ventilation systems. 08

Unit IV

Prevention of losses, pressure relief, provision for fire fighting, release of hazardous materials from tanks, pipes through holes and cracks , relief systems : types and location of relief's. 08

Unit V

Handling, transportation and storage of of flammable liquids, gases, and toxic materials and wastes, regulation and legislation, government role, risk management routines, emergency preparedness, disster planning and management. 08

TOT-851 DESIGN PROJECT

L : T: P

0 : 0: 12

Continuation of Term work of OT-753 with product and/or plant designing with a Techno-economic Feasibility Report of suitable size.

TOT-852: EDUCATIONAL TOUR

L : T: P

0 : 0: 12

Students will be taken for the visit of Industrial / Research organization, in their field of specialization, during the vacation period.