

## ELECTIVE

### TPT-011 : ECO-FRIENDLY AND SPECIALTY COATINGS

L : T : P  
3 : 1 : 0

#### Unit-I

Introduction to eco-friendly systems; ecological/environmental aspects, cost, products from renewable and non renewable sources, energy saving, reduction emission of volatile organic solvent, water as a substitute for organic solvents, merits and demerits of different systems; 08

#### Unit-II

Powder coatings; manufacture of powders, powder classification, types of powder coatings, application methods, uses, performance affecting parameters, aqueous systems; high solids coatings; considerations, influence of solvents, temperature, pigments, additives, crosslinking, etc. types low solvent and solventless coatings based on alkyds, polyesters, acrylics, polyurethanes, epoxies, etc., uses of high solids coatings in metallic and non-metallic finishes. 10

#### Unit-III

Radiation curable coatings; types of radiation, UV curing fundamentals of photopolymerisation, photo initiators, sensitizer, oligomers, monomers, problems associated with UV cured systems, electron beam curing-EB generators, factors affecting EB generators, factors affecting EB curing, uses of EB curing, other curing systems. 08

#### Unit-IV

Novelty finishes; wrinkle, hammertone, multicolour, crystal crackle, flamboyant etc.; special purpose coatings anti corrosive, heat resistant, fire retardant, electrical resistant (insulating), temperature indicating. 08

#### Unit-V

High visibility, phosphorescent, fluorescent, in tumescent, putrescent coatings, traffic/road marking paints, rail road coatings, coatings for electronic appliances, aerosols. 09

#### Reference Book

1. Organic Coating Technology, Vol, I & II by H.F. Payne
2. Surface Coatings, Vol, I & II by, OCCA, Australia
3. Outlines of Paint Technology by W. M. Morgan
4. Surface coatings science & technology by Swaraj Paul

### TPT-012 : INSTRUMENTATION IN COATING INDUSTRY

L : T : P  
3 : 1 : 0

#### Unit-I

Chromatographic Techniques : Theory practice and application of paper chromatography thin layer chromatography (TLC), Gas liquid chromatography (GLC) High pressure (Performance) liquid chromatography (HPLC) in coating industry for the analysis of solvents, monomers, plasticizers, vegetable oils, resins etc. Microscopy in coatings and coating ingredient : Microscopical examination of pigments, paints and paint films. Scanning electron microscopy (SEM) : Principle and practice. 10

#### Unit-II

Infra Red (IR) spectroscopy : Theory, instrumentation, qualitative analysis, monitoring chemical changes in coating materials, internal reflection spectroscopy, fourier transform infra red (FTIR) and quantitative analysis. Near Infrared (NIR) Spectroscopy. 10

#### Unit-III

Nuclear magnetic resonance (NMR) spectroscopy : nuclear spin MNMR equation, relaxation, The NMR instrument, chemical shift, spin-spin coupling, application of NMR to coatings and polymers. 10

#### Unit-IV

X-ray analysis : analysis based on X-ray diffraction and X-ray emission 06

#### Unit-V

Computer in coating Industry, Resin/polymer design, product formulation and costing, colour matching, raw material and formula file data bases for non technical applications, future trends, 08

#### Reference Book

1. Organic Coating Technology, Vol, I & II by H.F. Payne
2. Testing of Organic Coatings by Norman I. Gaynes
3. Paint Testing Manual-Gardener
4. Treatise on Coatings-Meyer & Long

## TPT-013 : PACKAGING TECHNOLOGY

L : T : P  
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### Unit-I

Concept of packaging, packaging values, scope of packaging: Toys, general consumables, Cosmetics, food pharmaceuticals, engineering materials and other utilities. 08

### Unit-II

Biotic and abiotic hazards associated, with packages. 04

### Unit-III

Packaging and forms : wood containers, glasswares, metal containers, paper and paper boards: folded cartons and setup boxes. 10

### Unit-IV

Corrugated fibre board, fibre tubes, cans and drums, plastics: films and foils, bags, envelopes and pouches, closures, applicators, pastners, labels, aerosols, cushioning and composites. 08

### Unit-V

Coating, adhesives and laminates, machinery equipment test methods, quality control, Laws and regulations : Package printing importance, Professional approach to package development. 10

### Reference Book

1. Handbook of Package Engineering by Joseph F. Hanlon
2. Edible Coatings & Soluble Packaging by Roger Daniels

## TPT-014 : PAINTING PRACTICES

L: T : P  
3 : 1 : 0

### Unit-I

Corrosion: General Mechanism, Nature of corrosion, factors influencing corrosion rate, control & prevention of corrosion. 06

### Unit-II

Surface Preparation

- (a) Mechanical - Hard cleaning, power tool cleaning, flame cleaning, Blast cleaning, cleaning & welds
- (b) Chemical - Solvent wiping & degreasing alkali cleaning, emulsifiable solvent cleaning, steam cleaning, acid cleaning, pickling, phosphating Zn & Fe Paint removers 08

### Unit-III

Practical aspects use & application of paints

- Quality control of paints
- Shop Painting of steel in fabricating plants 06

### Unit IV

Painting of Rail board bridges & structures

- Painting of Highway bridges & structures
- The Painting of steel vessels for fresh water service
- Painting of steel tanks
- Panting of steel in hydraulic structures 10

### Unit-V

Protection of Pipelines & other underground structures Painting of industrial plants

- (a) Water sewage works structures
- (b) Maintenance painting of steel coke oven plants
- (c) Petroleum refineries
- (d) Chemical plants
- (e) Colour in industrial plants

Metallizing

Causes & prevention of paint failure 10

### Reference Book :

1. Good Painting practices by J, Bigos

## TPT-801 : HIGH POLYMERIC ENGINEERING

L : T : P  
3 : 1 : 0

### Unit-I

Basic concept of polymeric engineering, classification of polymers; polymerisation techniques such as bulk, solution, emulsion and suspension; mechanism and kinetics of chain polymerisation, effect of temperature, pressure, initiator

Concentration monomer concentration; mechanism and kinetics of step growth polymerization molecular weight control; ionic polymerisation anionic polymerisation and cationic polymerisation coordination polymerization. 10

#### **Unit-II**

Copolymerisation mechanism and kinetics, copolymer equation monomer reactivity ratios and their determination, types of co-polymerization, instantaneous composition of feed and polymer, azeotropic: copolymerisation, study state kinetics. 06

#### **Unit III**

Molecular weight of polymer, molecular weight average and degree of polymerisation, polydispersity and molecular weight distribution practical significance of polymer molecular weight determination of molecular weight by cryoscopy ebulliometry, osometry, end group analysis, viscometry, light scattering and ultra-centrifugation fractionation of polymers precipitation extraction gradients elution gel permeation chromatographic technique. 12

#### **Unit- IV**

Polymer degradation, types of degradation thermal, mechanical ultrasonic waves photodegradation, high energy radiation, oxidative and chemical degradation. 06

#### **Unit-V**

Physical and mechanical properties of polymers, glass transition temperature its importance, amorphous and crystalline polymers and their properties and influence on surface coatings. 06

#### **Reference Book**

1. Organic Coating Technology, Vol, I & II by H.F. Payne
2. Principles of Polymer Chemistry by P. J. Flory
3. Text Book of Polymer Science by F. W. Billmeyer

### **TPT-802 : CORROSION ENGINEERING**

**L : T : P**

**3 : 1 : 0**

#### **Unit-I**

Definition, corrosion damage, functional and economic aspects of corrosion, relevance of corrosion studies, classification of corrosion process, General chemistry of corrosion metals alloys and solid solutions, crystal imperfection, macroscopic defects etc. 01

#### **Unit-II**

Electro-chemistry, electrolysis, emf, and emf series, galvanic cells, concentration cells electrolytic cells, passivation, characteristic parameter, mechanism of passivation oxidising and non-oxidising anodic inhibitors, Theories of passivation like-film theory, adsorption theory, kinetic theory etc., Mechanical passivity. 10

#### **Unit-III**

Different form of corrosion: chemical uniform biallic galvanic, crevice under film pitting corrosion intergranular, Selective erosion, stress corrosion cracking, corrosion fatigue, their mechanism, and remedial measures, Hydrogen & radiation damages, 08

#### **Unit-IV**

Corrosion under various conditions: Atmosphere underground, immersion, marine and liquid metal corrosion; mechanism and dependance parameters of metal oxidation catastrophic oxidation internal oxidation and oxidation of alloys etc. 06

#### **Unit-V**

Corrosion in various industries, , Boiler plant, chemical industries, petroleum industries, building industry, fertilizer industry etc. : Corrosion testing: Physico chemical methods, electro-chemical methods, corrosion inspection and monitoring, corrosion rate measurements, Advantages and defects of corrosion testing methods : Corrosion control: Practical and fundamental approach, Selection of materials, modification of metals, change in Design and corrosive environment corrosion inhibitor surface coating and Electro chemical corrosion protection methods such as cathodic and anodic protections. 06

#### **Reference Book**

1. Organic Coating Technology, Vol, I & II by H.F. Payne
2. Surface Coatings, Vol, I & II by, OCCA, Australia
3. Outlines of Paint Technology by W. M. Morgan
4. Good Painting Practices by Joseph Bigos

### **TPT-803 : DECORATIVE, INDUSTRIAL & HIGH PERFORMANCE COATINGS**

**L : T : P**

**3 : 1 : 0**

#### **Unit-I**

Exterior coatings, formulation considerations, solvent and water based coatings, compositions, sealers, primers, stoppers, undercoats, finish coats coatings for wood, masonry, metal etc. roof coatings; functions of roof coatings, types of roofing

substrates criteria in selecting, coating systems, types of top coats, etc. ; interior coatings; factors determining selection of coatings, solvent and water based systems, coatings for wood metal masonry etc, wall coating, floor paints, sealer; primers stoppers, under coats, finish coats, computing coverage and performance, formulation, manufacture & testing of varnishes & lacquers. 10

#### **Unit-II**

Selection of decorative paints; factors in selection, choice of solvent and water

Thinable, recommendation of finishes, paint tinting the system technical aspects components, manufacture and standardisation of tinters, universal tinters, effects of tinters tinting machines and equipments reproducibility of colours water-borne coatings; water soluble and water reducible binders such as oils, alkyds acrylics, etc., preparation of binders by various methods such as introduction of non ionic and zwitterion intermediates etc. dispersion colloids and solutions, stability of aqueous system film formation, etc.; emulsion paints; phase of emulsion emulsifying agents preparation of phases stability of emulsions, oil in water, water in oil and emulsifiable paints, drying mechanism, comparison with ordinary paints; formulation, manufacture application & use; current aqueous system alkyds acrylics, vinyls, epoxies polyurethane etc. 08

#### **Unit-III**

Industrial coatings; substrates, application and cure, air drying forced drying and stoving, clear finishes for metal and wood, furniture finishes, lacquers automotive coatings ; materials of construction, primers, fillers, surface base coats, top coats, clear coats refinishing, etc.; air craft finishes; fabric air craft, metal skinned air craft modern aircraft finishes application, Surface cleaning and removal of air craft finishes; marine coatings; dock and harbour installations, offshore structures, ships paints, fouling, organisms leaching rate, types of antifouling paints, recent developments; industrial structures and industrial buildings (chemical plants) substrate types and their preparation, primers, undercoats, finish coats non convertible and convertible red oxide-zinc chromate, zinc rich primers etch primers, conversion coatings, etc., painting specification, maintenance paintings, painting of concrete. 10

#### **Unit-IV**

Miscellaneous coatings; finishes for appliances, swimming pool, can coatings, coil coatings, coatings for metal containers, paper, plastic, leather, textile, etc, heavy duty coatings; structure, design, surface preparation inhibitive primers, inorganic zinc primers, organic zinc primers, tie coating top coats, application methods and weather conditions. 06

#### **Unit-V**

Coatings for nuclear power plants, radiation resistance of coatings, testing etc, electrodeposition coatings; principles of anodic and cathodic electrodeposition, coating compositions based on alkyds, epoxies, polybutadienes, acrylics, polyurethanes, etc, application methods and cure, operating conditions, merits and demerits, uses; colour aesthetics in surface coatings safety colour standards 06

#### **Reference Book**

1. Organic Coating Technology, Vol, I & II by H.F. Payne
2. Surface Coatings, Vol, I & II by, OCCA, Australia
3. Outlines of Paint Technology by W. M. Morgan

## **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 flammable liquids, gases, and toxic materials and wastes, regulation and legislation, government role, risk management routines, emergency preparedness, disaster planning and management. 08

### **TPT-851 EQUIPMENT DESIGN PROJECT**

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The student (s) will be required to prepare a detailed project report on fabrication of an equipment / establishment of a plant for processing of a food commodity for production of food product(s) with complete lay-out and economic analysis for assessment.

### **TPT-852: EDUCATIONAL TOUR**

**L : T: P**

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