SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR

SYLLABUS EFFECTIVE FROM: 2017-18
Programme & Subject: M.Sc. (Polymer Science & Technology)

Semester: IV

Paper Code: PS04CPST21	**Total Credit: 4**
Title Of Paper: Rubber Technology	

Unit	Description in detail	Weightage (%)
I	**General Introduction & Natural Rubber:** Introduction, Source, Cultivation, Harvesting, Biosynthesis of rubber, Composition of latex, Crop Collection, Modified forms of natural rubber, Properties of natural rubber, Applications.	**25%**
II	**Synthetic Rubber:** Polybutadiene, Polyisoprene, Polychloroprene, Styrene – butadiene rubber, EPDM, Butyl & halobutyl rubber, Nitrile rubber, Acrylic elastomer, Chlorosulphonated polyethylene, Silicone rubber, Fluorocarbon elastomer	**25%**
III	**Rubber Compounding** Introduction to mixing, Distributive mixing, Dispersive mixing, Two roll mill, Banbary mixer, continuous mixing, Vulcanizing agents, Vulcanizing accelerators, Activators, Retarders & inhibitors, Fillers, antidegradents, softners, plasticizers, processing aids etc. relation between curing system and properties. Carbon black as a reinforcing agent for rubber industries.	**25%**
IV	**Rubber Processing:** Calendaring, Extrusion, Molding processes, Rubber Products such as Tyres, Belting & Hoses, Finished product testing, Rubber recycling.	**25%**

Basic Text & Reference Books:-

- Basic Compounding and Processing of Rubber, Harry Long, American Chemical Society, New Jersey.
- Rubber Handbook, Vanderbilt, Vanderbilt World trade cooperation, New York.
- Rubber Technology and Manufacture, C.M. Blow, Butterworth, London.
- Rubber Technology Handbook, Hofman.
- High Polymer Latices, D.C. Blackly
- Applied science of Rubber, William, and J.
- Polymer Processing, Morton Jones. Chapman & Hall.
- Polymer Processing, McKelvey.
- Rubber Processing, Peter S Johnson, Hanser Publishers
- Rubber Technologist Handbook,J R White & S. K. De, Rapra Technology

Paper Code: PS04CPST22	Total Credit: 4
Title Of Paper: Specialty Polymers	

Unit	Description in detail	Weightage (%)
I	High temperature and fire resistant polymers: Introduction, Improving low performance plastics for high temperature use, Polymers for low fire–hazards, Polymers for high temperature resistance–Fluoropolymers, Aromatic polymers, Poly ethers, Polyphenylenesulphide, Polysulphones, Polyketones and Heterocyclic polymers.	**25%**
II	Hydrophilic polymers: Natural polymers–Carbohydrates, Proteins, Semisynthetic polymers, Synthetic polymers– Hydrogel polymers, Polyacrylamide hydrophilic polymers, Polyvinyl alcohol, Polyvinyl pyrrolidone, Superabsorbent polymers.	**25%**
III	Ionic polymers: Introduction, synthesis, physical properties and applications.	**25%**
IV	Polymers with electrical & electronic properties: Conducting polymers–conducting mechanisms, Polyacetylene, Polyparaphynelenes, Polypyrroles, Polyaniline, Photoconducting polymers, Polymers in optoelectronics, Polymers with piezoelectric, pyroelectric and ferro electric properties, Photoresists for semiconductor fabrication.	**25%**

Basic Text & Reference Books:-

- Engineering Polymers, R.W. Dyson, published by Chapman and Hall, New York.
- Specialty Polymers, R.W. Dyson, published by Chapman and Hall, New York.
- Encyclopedia of polymer science and Engineering, Wiley Inter science, New York.
- Comprehensive polymer science Sir, Geoffrey Allen and Sunder L. Aggrawal, Pergamon press, New York.
- Engineering materials Handbook, Vol, 1-3, ASTM International, USA.
- Plastics Materials, J. A. Brydson, Butterworth, London.
- Inorganic Polymers, James E. Mark, Harry R. Allcock, Robert West, Prentice Hall, NJ, USA.

Paper Code: PS04CPST23	Total Credit: 4
Title Of Paper: Polymer Blends & Adhesives	

Unit	Description in detail	Weightage (%)
I	**Polymer blends:** Terminology, classification, equilibrium phase behavior and transitions, thermodynamics, methods of studying miscibility and immiscibility, molecular interpretation of polymer–polymer miscibility, Flory-Huggins theory, parameters influencing miscibility, methods of enhancing miscibility, Techniques for preparation and characterization of polymer blends. Phase morphology and application.	**25%**
II	**Compatibilization:** Practical compatibilization, factors affecting miscibility, compatibilization by Physical processes, Physical additives, polymer modifications for physical compatibilization, reactive compatibilizers and reaction mechanism. Commercial polymer blends: Thermoplastics polymer blends and thermosetting polymer blends viz. High impact polystyrene (HIPS), Acrylonitrile-Butadiene-Styrene (ABS), Polypropylene, Nylons, Epoxy resins.	**25%**
III	**Adhesives–I**: Concepts and terminology, classification of adhesive, advantages and disadvantages of adhesives bonding, joint design, adhesive selection, adhesive properties surface preparation and bonding process.	**25%**
IV	**Adhesives–II**: Characteristics of adhesive material, Solvent cementing of thermoplastics, cementing of thermosetting Polymer, Welding of thermoplastics, Ultrasonic assembly, and testing of adhesive bonds.	**25%**

Basic Text & Reference Books:-

- Multi component polymer systems, I.S. Miles and S. Rostami, Chapman & Hall, New York.
- Polymer blends and Alloys, G.O. Shonaike and G.P. Simon, Marcel Dekker Inc, New York.
- Polymer Blends, Vol 1& 2, D.R. Paul and Seymour Newman, Published by Academic Press, New York.
- Plastics Engineering Handbook, Joel Frados, Van Nostrand Reinhold, New York.
- Plastics Engineering Handbook, M.L. Berins, Van Nostrand Reinhold, New York.
- Adhesives Handbook, Butterworth's, J. Shields.
- Adhesives Technology Handbook, Sina Ebnesassad, USA.
- Coloring of Plastics, Albrecht Muller, HANSER, Germany

Paper Code: PS04CPST24	Total Credit: 8
Title Of Paper: Project Work	

Unit	Description in detail	Weightage (%)
	A project report based on literature survey and laboratory work conducted on topics related to Polymer Science, Polymer Technology & Chemistry is to be submitted and presented as a seminar by each student.	**100 %**

Paper Code: PS04EPST21	Total Credit: 4
Title Of Paper: Environmental Science	

Unit	Description in detail	Weightage (%)
I	**Introduction to Environment Science:** Concepts and scope of study, Environmental composition, nomenclature of some useful Terms, and ecology. **Hydrosphere:** Water resources, Physical and Chemical properties of water, sea water model, microbiological processes, organic and inorganic matters in water. **Lithosphere:** Concentric layers of earth, Physical and Chemical weathering processes, composition of soil, Nitrogen cycle and NPK in soil. **Atmosphere:** Composition & structure of atmosphere, particles, ions, radicals and chemical reactions in atmosphere. **Biosphere:** Definition, ecosystem and natural cycles.	**25%**
II	**Air Pollution:** Environmental pollution, classification of pollutants, environmental indicators. Sources and effect of air pollutants: SMOK, FOG, SMOG, PAN, PAH, greenhouse effect, acid rain, ozone depletion, EL Nino phenomena. Analysis of air pollution.	**25%**
III	**Water pollution:** Definition, types of waters pollutants, Environmental toxicology and toxic elements & pesticides in water, Impact on enzymes, Biochemical effect of pesticides.Water and waste water analysis; collection of sample, Determinations of water quality parameters: Alkalinity, acidity, TDS, TH, D.O., BOD, COD, Chlorides, sulphate, nitrate and nitrite etc.	**25%**
IV	**Soil pollution and Waste management:** Introduction to soil pollution; waste and pollutants in soil. Classification of wastes, overview of waste management program, green chemistry, methodologies, techniques available and new approaches.	**25%**

Basic Text & Reference Books:-

- Environmental Chemistry by J. W. Moore & E. A. Moore, Academic Press. Inc. New York, 1976.
- Environmental Chemistry by A.K.De,4th edition, New Age International Publishers.
- Principles of Environmental Science: Inquiry and applications by William P. Cunningham & Mary
- Cunningham, 1st edition, 2002, Tata McGraw Hill Publishing Company Ltd., New Delhi.

Paper Code: PS04EPST22	Total Credit: 4
Title Of Paper: Technology of Essential Oils, Surfactants & Cosmetic Products	

Unit	Description in detail	Weightage (%)
I	Essential Oils, chemical constituents of essential oils, manufacturing technology, utilization of essential oils	25%
II	Surfactants, classification & physico chemical properties of surfactants, practical applications of surfactants in various fields, manufacturing of various industrial surfactants.	25%
III	Cosmetics, classification, raw materials for cosmetics, manufacturing of various cosmetic products.	25%
IV	Modifications of oils, fats & waxes, Introduction to chemical reactions of oils, fats & fatty acids, manufacturing of DCO, blown, boiled, stand & malenised oils.	25%

Basic Text & Reference Books:-

- The chemistry of oils & fats,F.D.Gunstone,Blackwell Pub.
- Baileys Industrial oils & fats products,Vol 1-5,John Wiley & Sons
- Essential Oils,Vol 1-7,D.Gunther,R.E.Krigger Pub Comp.,New York
- Cosmetic Science & Technology,Vol 1 &2,Wiley Interscience,New York
- Cosmetics,Sopas & Perfumes,W.A.Poucher,Chapman Hall,London & New York
- Handbook of surfactants,Porter,Mc Graw Hill Pub