

**SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR**



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

Semester: III

Syllabus with Effect from: June-2017

Paper Code: PS03CPST21	Total Credit: 4
Title Of Paper: Polymer Rheology	

Unit	Description in detail	Weightage (%)
I	Introduction to Rheology: Different parameters, Rheological equation of state, Newtonian and Non-Newtonian, Importance aspects of rheology, Importance of rheology on polymer processing, shear thinning behavior, influence of temperature and molecular structure.	25%
II	Flow Properties: Flow through circular tube, flow between parallel plates, Die Swell, and Melt fracture, Sharkskin, Orientation and Shrinkage, Frozen in orientation, Weissenberg effect, and entrance effect.	25%
III	Rheology in polymer processing: Introduction, Low flow process, Mixing process, Constrained flows, Free surface flows, Bulk deformations, Injection moulding, Blow moulding, Film blowing and Sheet extrusion.	25%
IV	Measurements of flow properties: Mixing equipments, concentric cylinder rheometer, Cone and plate rheometer, Capillary rheometer, Parallel disc rheometer, torque rheometer, rheo-optics. Flow properties of individual polymers like polyethylene, propylene, polystyrene, poly vinyl chloride, nylons, poly acetals, poly tetrafluoroethylene, polycarbonates and rubbery materials.	25%

Basic Text & Reference Books:-

- Polymer and Composite Rheology, Rakesh K. Gupta Marcel Dekker Inc., New York
- Polymer Melt Rheology, F. N. Cogswell, George Godwin Ltd., London
- Rheology of Polymer Systems, Carreau, De Kee, Chhabra, Hanser Gardner Publication Inc., Cincinnati.
- Flow of high polymers, Stanley Middleman, Inter science publishers.
- Melt Rheology and its role in Plastics processing, John M. Dealy and Kurt. F. Wissbrun, Van Nostrand Reinhold, New York.
- Plastics Rheology in Plastics Quality Control, John M. Dealy and Peter C. Saucier, Hanser Gardner Publication Inc., Cincinnati.

Paper Code: PS03CPST22	Total Credit: 4
Title Of Paper: Polymer Composites & Fibre Technology	

Unit	Description in detail	Weightage (%)
I	Composites: Introduction to composite materials, definitions, classifications, applications, advantage and disadvantages of composites. Types of reinforcements, short fiber reinforcement, matrix material, types of mold for composites and preparation of molds, release agents, core materials, coupling agents, fillers and pigments, gel coats. Spinning & Finishing of fiber: Introduction, Melt spinning, Solution spinning, Dry spinning, Gel spinning, Wet spinning	25%
II	Reinforcing materials: Definition of fibres, Classification and nomenclature of fibres, Definition of various textiles terms, structure principles of fibre forming polymers. Natural & Synthetic fiber: Introduction, Cotton, Rayon, Cellulose acetate, Wool, Polyamide, Acrylic fibre, Polyethylene terephthalate, Polyolefines, Spandex, Glass, Asbestos, Carbon, Steel fibres preparation, properties and applications.	25%
III	Polymer matrix materials: Important thermosetting materials viz. Polyester, Epoxy and Phenolics and their curing systems. Thermoplastics and elastomeric materials, properties and applications of composites.	25%
IV	Processing of composites: Sheet moulding compounds (SMC), Dough moulding compounds (DMC) and Prepregs. Composites processes like Hand lay up, Spray lay up, Vacuum bag, Pressure bag, Autoclave moulding, Cold press, Hot press moulding, Resin injection, Resin transfer moulding, Foam reservoir, Filament winding, Centrifugal casting, Pultrusion, continuous laminations, Injection moulding, Compression and transfer moulding of composites. Troubleshooting and remedies for composite processing.	25%

Basic Text & Reference Books:-

- Polymer blends and Composites, L.H. Sperling, Published by Plenum Press.
- Handbook of Plastics Elastomers and Composites, Charles A Harper, McGraw Hill, New York.
- FRP technology- Fiber reinforced Resin systems, Weatherhead, Applied Science, and London.
- Handbook of Polymer Composites for Engineer's, Leonard Holloway, Jaico, India.
- Handbook of Reinforcements for plastics, Milewski Katz, Van Nostrand Reinhold, New York.
- Polymer Engineering Composites, M.C. W Richardson, Published by Applied science, London.
- Modern Textiles by Dorothy Lyle
- Essentials of Textiles by M.J. Joseph
- Textile fibres and their use by K.P. Hess

Paper Code: PS03CPST23	Total Credit: 4
Title Of Paper: Petrochemicals	

Unit	Description in detail	Weightage (%)
I	Introduction: Petrochemical, Development of petrochemical industry, Petroleum refining, Petrochemical feed stocks from petroleum refining, The basic building block processes, Petrochemical process technology, Costs in chemical processing, Primary raw materials for Petrochemicals like Natural gas, Crude oils, coal, oils shell, tar sand and gas hydrates.	25%
II	Crude Oil Processing and Production of Hydrocarbon: Introduction, Physical separation Processes, Conversion Processes, Production of Olefines, Paraffinic hydrocarbon, olefins hydrocarbons, dienes, aromatic hydrocarbons, liquid petroleum fraction and residues.	25%
III	Alkanes and higher Paraffin based Chemicals: Introduction, Chemical based on synthetic gases, Chemical based on direct reaction of methane, ethane, propane and naphtha based chemicals from high molecular weight n-paraffin.	25%
IV	Chemicals based on olefin diolefin and aromatic hydrocarbon: Introduction, Chemicals from n-butenes, isobutylenes, butadiene, benzene, toluene, xylene.	25%

Basic Text & Reference Books:-

- Chemistry of Petrochemical Process, Sami Matar, Lewis F. Hatch, Gulf Professional Publishing, Boston.
- Fundamental of Petroleum Chemical Technology, P. Belov, Mir Publications, Moscow.
- Advanced Petroleum Refining, G. N. Sarkar, Khanna Publishers, Delhi
- Petrochemicals, Peter Wisheman, John Wiley & Sons, New York.

Paper Code: PS03CPST24	Total Credit: 4
Title Of Paper: Practical –Polymer Processing & Testing – II	

Unit	Description in detail	Weightage (%)
I	Details to be Worked Out by the Department	100 %

Paper Code: PS03CPST25	Total Credit: 4
Title Of Paper: Practical –Polymer Synthesis	

Unit	Description in detail	Weightage (%)
I	Details to be Worked Out by the Department	100 %

Paper Code: PS03EPST21	Total Credit: 4
Title Of Paper: Analytical Techniques	

Unit	Description in detail	Weightage (%)
I	Fundamentals of Analytical Chemistry: Definitions, Application of analytical Chemistry, Classification of analytical techniques and importance, GMPs and its Components, Verification and Validation in chemical analysis.	25%
II	Chemical calculations and Chromatography: Concentration units, preparation and standardization of analytical reagents Introduction to chromatography techniques: classification and working principles. (Paper chromatography, Thin Layer chromatography, Column chromatography, HPLC, GC and GPC)	25%
III	Fundamentals of Spectroscopy and Components of Optical Instruments: Introduction, Classification, EMR and Interactions of EMR with Matters, Sources of radiations, wave length selectors, sample holders, detectors and signal processors and readouts, Lambert's and Beer's Law, FTIR, NMR, Mass Spectroscopy	25%
IV	Instrumental Polymer Analysis: Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry, Thermomechanical Analysis, Dynamic Mechanical Analyses, Scanning electron Microscopy (SEM), TEM	25%

Basic Text & Reference Books:-

- Skoog, Holler, Niemon, "principles of instrumental analysis" 5th edition, Saunders college publisher.
- Robert D. Braun "Introduction to chemical analysis" McGraw-HILL International Edition.
- Robert D. Braun "Introduction to instrumental analysis" McGraw-HILL International Edition.
- Gary D. Christian. "Analytical chemistry" 6th edition John Wiley & sons, Inc. 2004
- B. K. Sharma. "Instrumental method of chemical analysis" 24th edition, GOEL publishing house Meerut .2005
- R. A. Day, jr , A. L. Underwood., "Quantitative analysis" 6th edition, Prentice –Hall of India Private limited, New Delhi. 2006.
- L.Huber, "Validation and qualification in analytical laboratories" 2nd Edition, 2007.

Paper Code: PS03EPST22	Total Credit: 4
Title Of Paper: Selected Topics in Polymer Science	

Unit	Description in detail	Weightage (%)
I	Polymers in Medicine: Introduction, Polymers and Polymer Chemistry Pertinent to Medical Application, Medical Applications, Dental Application, Orthopedic Applications, Ophthalmology, Ear, Brest Implant, Facial Implants, Gynecology	25%
II	Specialty Coatings and Adhesives: New Generation Hybrid Coating, Antifouling Coating, Coating based on sustainable Resource-Development of Anticorrosive coating Based on Seed Oils, Specialty Adhesive- Synthetic & Natural Adhesive	25%
III	Inorganic Polymer: Introduction, Polyphosphazenes, Polysiloxanes and Related Polymer, Polysilane and Related Polymer, Micellaneous Inorganic Polymer	25%
IV	Product Design: Introduction, Geometric Shape, Plate, Beam, Rib, Column, Torsion, Sandwich, Gear, Bearing, Grommet, Gasket, Shape – Cylinder, Sphere, Tank, Pipe, spring, Building, Transportation, Medical, Metal, Design limitation and Constraint	25%

Basic Text & Reference Books:-

- Specialty Polymers materials & Application, Faiz Mohammad
- Inorganic Polymer, James E. Mark, Prentice Hall Advanced References Series
- Plastics Engineered Product Design, Dominick V Rosato, Elsevier