

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Course Type	Course Code	Name Of Course	Theory/Practical	Credit	Contact Hrs/Week	Exam Duration in hrs	Component of Marks		
							Internal	External	Total
							Total/ Passing	Total/ Passing	Total/ Passing
Core Course	PS01CPST07	Technology of Polymer Processing	Theory	4	4	3	30	70/28	100/40
	PS01CPST08	Organic & Polymer Chemistry	Theory	4	4	3	30	70/28	100/40
	PS01CPST09	Industrial Management & Psychology	Theory	4	4	3	30	70/28	100/40
	PS01CPST04	Practical : Characterization of Raw Materials & Polymers	Practical	4	6	3	30	70/28	100/40
	PS01CPST05	Practical : Chemical Engineering Operation - I	Practical	4	6	3	30	70/28	100/40
	PS01CPST06	Comprehensive Viva Voce		1	--	--	--	50/20	50/20
Elective Course (Any One)	PS01EPST03 OR PS01EPST04	Industrial Chemistry-I OR Material Science	Theory	4	4	3	30	70/28	100/40



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST04	Total Credit: 4
Title Of Paper: Practical : Characterization of Row Materials & Polymers	

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



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST05	Total Credit: 4
Title Of Paper: Practical : Chemical Engineering Operation Practicals	

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



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST06	Total Credit: 1
Title Of Paper: Comprehensive Viva	

Unit	Description in detail	Weightage (%)
I	Comprehensive Viva based on Core & Elective Courses of Semester	100%



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST07	Total Credit: 4
Title Of Paper: Technology of Polymer Processing	

Unit	Description in detail	Weightage (%)
I	Principles of Polymer processing: Introduction to Polymer Processing, Melt processing of thermoplastics and melt processing of thermosetting polymers, Introduction to mixing, Types of mixers- Twin drum tumbler, ribbon blender, high speed mixer, ball mill and Cowles dissolver, two roll mill, Banbary mixer,	25%
II	Compression & Injection Moulding: principles, Melt processing of thermoplastics and melt processing of thermosetting polymers, Materials- factors to be considered while processing, Techniques of preheating, Types of compression & injection moulding, Comparison with transfer moulding, Specifications of injection moulding machine – injection & clamping unit.	25%
III	Extrusion, Calendering & Blow Moulding: Fundamental principles, operation of single screw & twin screw extruder, Extrusion blow moulding, Injection blow moulding and Stretch blow moulding, calendaring process.	25%
IV	Thermoforming, Rotational Moulding, Casting Processes & Polymer Foam: Fundamental principles, Materials, general production method, Types, processes, applications.	25%

Basic Text & Reference Books:-

- Polymer Processing, Morton & Jones, Chapman & Hall.
- Plastics Engineering, R. J. Crawford, Maxwell Macmillan International.
- Plastics Engineering Handbook, M.L. Berins, Van Nostrand Reinhold, New York.
- Plastics Engineering Handbook, Joel Frados, Van Nostrand Reinhold, New York.
- Plastics Processing Data Hand Book, Dominick. V. Rosato and Donald V. Rosato, Van Reinhold Nostrand, New York.
- Plastics materials & Process, H. Goodman, Van Nostrand Reinhold Company, New York.
- Plastics materials and processes, Seymour S. Schwartz and Sidney, H. Goodman, Van Nostrand Reinhold.
- Principle of Polymer Processing, R.T. Fenner, Maxwell McMillan International Edn, London.
- Plastics Extrusion Technology Handbook, Sidney Levy and James F. Carley, Industrial Press, New York.1989.
- Plastics Extrusion Technology, FriedhlmHanser, Hanser Publications, New York.
- Dies for plastics extrusion, M.V. Joshi, Macmillian India Ltd, India.
- Mixing in Polymer Processing, Chris Rauwendaal, Marcel Dekker, New York.
- Blow Moulding Handbook, Dominic Rosato and Donald Rosato, Nostrand Reinhold, New York



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST08	Total Credit: 4
Title Of Paper: Organic & Polymer Chemistry	

Unit	Description in detail	Weightage (%)
I	Preparations and applications of following reagents: Aluminium tertiary butoxide, BF ₃ , DCC, Ozone, Per benzoic acid, Pt & Pd, Selenium, Per iodic acid, PPA, Di azo acetic ester.	25%
II	Selected Name reactions and Rearrangements: Aldol condensation, Arndt-eistert, Cannizzaro, Darzen, Dakin, Diels-alder, Elbs persulphate, Houben Hoesch, Knoevenagel, Leucarts, Meerwin pondorff verely, Pechmann, Perkin, Wurtz, Reimer tiemann, Wolf kishner, Wurtz-fittig.	25%
III	Introduction to Polymer Science: Importance of polymers, Basic concepts, Classification of polymers, Thermoplastics, thermosetting behavior, tacticity in polymers, average molecular weight concept, Polydispersity and molecular weight distribution, Crystallization of polymers, degree of crystallinity, glass transition temperature (T _g). Chemistry of polymerization and its techniques: Addition polymerization- free radical, ionic, co-ordination polymerization, Condensation polymerization, Copolymerisation, Polymerization techniques.	25%
IV	Polymer Degradation: Introduction, Types of degradation- thermal degradation, mechanical degradation, degradation by ultrasonic waves, photo degradation, degradation by high-energy radiation, oxidative degradation and hydrolytic degradation and biodegradation.	25%

Basic Text & Reference Books:-

- Organic Synthesis based on Name reaction and unnamed reaction, A.Hassner & C.Stummer, Pergamon press. 2nd edition
- Advanced Organic Chemistry- Reaction Mechanism & Structure, J.March, John Wiley & Sons. 4th edition
- Organic Chemistry Vol 1 & Vol 2, I.L.Finar, Long man Scientific. 5th edition
- Reaction mechanism and reagents in organic chemistry, G.Chatwal, Himalaya publishers.
- Organic chemistry, warren, oxford university press.
- Polymer Science, V.R.Gowarikar, New age International, Mumbai
- Introduction to polymer Chemistry, P.J.Flory, Asian Books
- Polymer Technology, Miles & Briston, J.G.Chemical Publishing Company, New York



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01CPST09	Total Credit: 4
Title Of Paper: Industrial Management & Psychology	

Unit	Description in detail	Weightage (%)
I	Human Resource Management: Introduction, Acquisition of Human resources, Development of human resources, Motivation of human resources.	25%
II	Financial & Marketing Management: Nature and scope of financial management, financial statement and analysis, funds flow, cash flow, cost concepts, financial planning, investment planning and analysis, budgeting and business plan. Introduction, analyzing marketing opportunities, developing marketing strategies, planning marketing programmes.	25%
III	Psychology In Industry: Causation in behavior. Attitude, Frustration, Morale and group processes, Causes of stress, duration and intensity of stress. Stress and job performance, stress threshold, personality and stress. Stress Management.	25%
IV	Psychological Tests: Design of jobs. Industrial training. Motivation. Fatigue.	25%

Basic Text & Reference Books:-

- Marketing Management, Philip Kotter, Prentice- hall India 9th edition.
- Personal or Human Resource & Personnel Management, D.A Decenzo, S.P. Robbins, PH India pub. 3rd edition.
- Industrial Marketing Strategy, Fredrick Webster, 3rd edition, John wiley & Sons.
- N. R. F Maier, Psychology in industry, Oxford and I B H Publishing co.
- T. W. Harwell., Industrial Psychology, Oxford and I B H Publishing co.
- Keith Davis & John . W. Newsyrom, Human Behaviour at work, 8th Edn. McGraw Hill
- V.O. Jenks, Human Relations in Organizations Haper & Row (1990)
- M. L. Blum, J. C. Naylor, Industrial Psychology, CBS Publishers



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01EPST03	Total Credit: 4
Title Of Paper: Industrial Chemistry - I	

Unit	Description in detail	Weightage (%)
I	Distillation: Enthalpy concentration diagrams, Use of Ponchon Savarit method in the design of multistage tray towers and packed towers. Gas Absorption: Choice of solvent for absorption, Minimum Liquid- Gas ratio for Absorbers, HETP in continuous contact equipments.	25%
II	Liquid- Liquid Extraction: Choice of solvent for extraction, Binodal solubility curves, Calculations for single stage and multi stage cross & countercurrent extraction, Differential Extractors. Drying: Rate of batch drying, calculations for cross and through circulation drying, Rate of drying for continuous driers, Hold up in rotary driers. Filtration: Theory of Filtration, Filtration Calculations, Filtration in centrifuges.	25%
III	Boundary layer concept, Calculations for reciprocating and centrifugal pumps, Use of air vessels in pumps, Vapour locking and NPSH. Design of flow meters. Pressure and Vacuum producing devices. Dimensionless analysis using Rayleighs and Buckingham II method.	25%
IV	Motion of particles through fluids: Terminal settling velocity of particles settling under Stokes, Intermediate and Newton's range in free & hindered settling, Mechanism of fluidization, Design of fluidized bed columns.	25%

Basic Text & Reference Books:-

- Mass Transfer Operations, Robert Treybal, Mc.Graw Hill Co. 3rd Edition.
- Unit Operations of Chemical Engineering, W. Mc.Cabe, J. Smith, Mc.Graw Hill Co 7th edition.
- Chemical Engineering,, Vol. 1 to VI , Coulson & Richardson, Pergamon Press. 3rd edition.
- Fundamentals of Engg. Heat & Mass Transfer, R.C. Sachieve, Wiley Ltd.
- Basic Principles and Calculations in chemical engg., D. Himel Blan, Prentice Hall
- Chemical Engg. Handbook, Robert Perry. 7th edition.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: I
Syllabus with Effect from: June-2013

Paper Code: PS01EPST04	Total Credit: 4
Title Of Paper: Material Science	

Unit	Description in detail	Weightage (%)
I	Crystalline Solids: Crystal symmetry, crystal systems, crystal planes X-ray and neutron diffraction from crystals – structure determination. Bonding in crystals – ionic, covalent, metallic and molecular bonds, bond energies, imperfection in crystals – defects dislocations.	25%
II	Mechanical Properties: Elastic deformation, Anelastic deformation, viscous deformation, plastic deformation, mechanical testing, fracture, fatigue, creep and environment assisted cracking.	25%
III	Metals and Alloys: Solid phases, solid solutions-alloys-Hume Rothery Rules, phase rule, phase diagram, binary system, iron and cast iron – sheet- alloys for high temperature.	25%
IV	Ceramic and Polymers: Classification of ceramics – structure of ceramics electrical properties of ceramics, thermal and mechanical properties, refractories and glasses – polymers properties of polymers in relation to other material.	25%

Basic Text & Reference Books:-

- Materials Science & Processes – S.K. HajraChoudhury
- A first course in Materials Science – V.Raghavan
- Materials Science – J.C.Anderson&K.D.Leaver
- Introduction to solid state Physics – C.Kittel
- Introductory Materials Science – M.J.Starfird & A.M.Sharanger



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Course Type	Course Code	Name Of Course	Theory/Practical	Credit	Contact Hrs/Week	Exam Duration in hrs	Component of Marks		
							Internal	External	Total
							Total/ Passing	Total/ Passing	Total/ Passing
Core Course	PS02CPST08	Polymer Characterization	Theory	4	4	3	30	70/28	100/40
	PS02CPST09	Industrial Polymers	Theory	4	4	3	30	70/28	100/40
	PS02CPST10	Polymer Additives	Theory	4	4	3	30	70/28	100/40
	PS02CPST04	Practical: Polymer Processing & Testing	Practical	4	6	3	60	140	200
	PS02CPST11	Practical: Chemical Engineering Operation-II (Revised) (Effect From: November/December-2013)	Practical	4	6	3	60	140	200
	PS02CPST06	Comprehensive Viva Voce		1	--	--	--	50/20	50/20
Elective Course (Any One)	PS02EPST03 OR PS02EPST04	Industrial Chemistry-II OR Industrial Process Chemistry	Theory	4	4	3	30	70/28	100/40



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02CPST04	Total Credit: 4
Title Of Paper: Practical - Polymer Processing & Testing	

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



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02CPST06	Total Credit: 1
Title Of Paper: Comprehensive Viva	

Unit	Description in detail	Weightage (%)
I	Comprehensive Viva Based on Core & Elective Courses of Semester.	100%



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Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02CPST08	Total Credit: 4
Title Of Paper: Polymer Characterization	

Unit	Description in detail	Weightage (%)
I	Importance of Quality control and Characterization of molecular weight: Importance of specification & standards in quality control of polymers, Preparation of polymer test specimens and conditioning, determination of molecular weight by Ultra Centrifugation, Gel Permeation Chromatography. End Group Analysis, Ebulliometry, Cryoscopy, Osmometry, and viscometry.	25%
II	Material Characterization Test: Introduction, Melting point, Softening point, Thermal conductivity, Shrinkage, Melt Flow Index test, Particle size, Density, and bulk factor, Water and Moisture absorption.	25%
III	Mechanical, Electrical and Flammability Test: Introduction, Hardness, Tensile strength, Compression strength, Flexural strength, Impact strength, Dielectric strength, Dielectric constant, Insulation resistance and arc resistance, Ignition properties, Oxygen index test and smoke generation tests.	25%
IV	Chemical and Weathering Properties: Immersion test, Stain resistance test, Solvent stress cracking resistance test, Environmental stress cracking resistance test, Accelerated weathering test, Outdoor weathering of polymers.	25%

Basic Text & Reference Books:-

- Handbook of plastics test method, R. P. Brown, Longman Scientific and Technical.
- Handbook of plastics testing technology, Vishu Shah, John Wiley & Sons, New York.
- ASTM, BIS, ISO standards.
- Instrumental methods of Analysis, Will and Merritt, CBS Publisher, New Delhi.
- Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler and Timothy A. Nieman, Harcourt Brace Coolege Publishing, Philadelphia.
- Encyclopedia of Polymer science and Engineering, Wiley Inter science, New York.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02CPST09	Total Credit: 4
Title Of Paper: Industrial Polymers	

Unit	Description in detail	Weightage (%)
I	Thermoplastics Materials: Synthesis of monomers, Polymerization, Structure related properties, general properties and applications of various thermoplastics materials like polyolefin's, viz. Polyethylene, Polypropylene, olefinic copolymers, Vinyl polymers, Fluorine-containing Polymers, Poly(vinyl acetate) and its derivatives, Acrylic plastics, plastics based on Styrene and Cellulose plastics.	25%
II	Engineering Thermoplastics: Intermediates for Polyamides, polymerization of aliphatic polyamides, their structure and applications, Polyimide. Structure, properties and applications of Polyacetals and Polycarbonates.	25%
III	Thermosetting Materials: Manufacture, curing and application of Epoxide resins, Unsaturated Polyester resins, Polyurethanes, Phenolic resins, Urea-formaldehyde resins, Melamine-formaldehyde resins, Furan resins.	25%
IV	Thermoplastics Elastomers: Introduction, Structure related properties, general properties and applications of various TPE like styrenics, polyesters, thermoplastics poly urethanes (TPU), polyamides and thermoplastics olefinic elastomers (TPO).	25%

Basic Text & Reference Books:-

- Fundamental principles of polymer materials practices for engineers, Plastics Materials, Stephen L. Rosen, Barnes & Noble, New York.
- Plastics Materials, J. A. Brydson, Butterworths, London.
- Polymer Technology, Miles & Briston, J. G, Chemical Publishing company, Inc, New York.
- Plastics Materials and Processes, Seymour S. Schwartz S.H. Goodman, Van Nostrand Reinhold, New York.
- Plastics Technology, R. V. Milbey, McGraw Hill, Book Company New York,
- Polymer science and Technology of Plastics and Rubber, P. Ghosh, McGraw hill, New York.
- Engineering Plastics, R.W. Dyson, Chapman & Hall, New York.



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Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
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Paper Code: PS02CPST10	Total Credit: 4
Title Of Paper: Polymer Additives	

Unit	Description in detail	Weightage (%)
I	General aspects of Additives: Technical requirements of Additives, unavoidable side effects, Deterioration of properties and methods of incorporation of Additives into plastics.	25%
II	Lubricants internal and external: General principles, external and internal lubricants of plastics to processing, thixotropic agents, mold releasing agents, evaluation of lubricants and effects on plastics properties. Plasticizers, Theory of plasticization, primary and secondary plasticizers, classification of plasticizers, plasticization efficiency and their evaluation, plasticizers anomalies and anti-plasticization, loss of plasticizers and effects on plastics properties.	25%
III	Fillers and reinforcements: Introduction, general characteristics of fillers and reinforcements, mechanical and thermal properties of filled polymers. Classification of fillers and semi reinforcements, source, properties and application in plastics processing. Principles of filler selection, incorporation of filler into plastics matrix. Coupling agents, types, and action mechanism, evaluation of fillers and reinforcement and effects on plastics properties.	25%
IV	Specific Purpose Additives: Stabilizers- Primary, and secondary stabilizers, Metal deactivators, Light stabilizers, synergistic stabilizers, Evaluation of processing stabilizers and effects on plastics properties. Anti-ageing additives - Introduction, antioxidants, classification, action mechanism, synergistic and antagonistic effects of antioxidants combination. Ultra violet protective agents- types, action mechanism and effects on plastics properties. Optical property modifiers - Brightening agents, Inorganic and Organic pigments, Criteria for selection of pigments,	25%

Basic Text & Reference Books:-

- The role of additives in plastics, L. Mascia, Edward Arnold.
- Additives of plastics, Stepek, Springer Verlag, New York.
- Plastics additives and modifiers, Jesse Edenbaum, Van Nostrand Reinhold, New York.
- Plastics materials, J.A. Brydson, Butterworth Science, London.
- Additives for Plastics Handbook, Elsevier Advanced Technology, John Murphy.
- Polymer modifiers and additives, Marcel Dekker, John T. Lutz, Richard F. Grossman.
- Plastics Additives Handbook, 5th Ed., Hans Zweifel, Hanser Gardner
- Comprehensive polymer science, Pergamon, New York.
- Engineering materials Handbook, Vol, 1-3, ASTM International, USA.
- Plastics Engineering Handbook, Joel Frados, Van Nostrand Reinhold, New York.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: November/December-2013

Paper Code: PS02CPST11	Total Credit: 4
Title Of Paper: Practical - Chemical Engineering Operation - II	

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



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02EPST03	Total Credit: 4
Title Of Paper: Industrial Chemistry - II	

Unit	Description in detail	Weightage (%)
I	Introduction to heat transfer modes, heat transfer equipments used in polymer industry	25%
II	Calculations for Heat Transfer Equipments	25%
III	Mass Balance with and without Chemical Reaction	25%
IV	Energy Balance with and without Chemical Reaction	25%

Basic Text & Reference Books:-

- Unit Operations of Chemical Engineering, W.Mc.Cabe,J.Smith, Mc.Graw Hill Co 7th edition
- Chemical Engineering, Vol 1 to VI, Coulson &Richardson,Pergamon Press. 4th edition
- Engineering Heat Transfer,C.P.Gupta, R.Prakash, Nomchand& Bros.,Roorkee. 7th edition.
- Process Heat Transfer, D.Q.Kern, Mc.Graw Hill Co.
- Fundamentals of Engg. Heat & Mass Transfer, R. C. Sachieve, Wiley Ltd.
- Basic Principles and Calculations in chemical engg.,D.HimelBlan,Prentice Hall
- Stoichiometry, H. T. Bhatt, S. M. Vora, Tata Mc.Graw Hill Co. 3rd edition.
- Chemical Process Principles,Vol I, Houghen, Watson, Asian Pub. House



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: II
Syllabus with Effect from: June-2013

Paper Code: PS02EPST04	Total Credit: 4
Title Of Paper: Industrial Process Chemistry	

Unit	Description in detail	Weightage (%)
I	Study of following processes with special emphasis on chemistry & chemical engineering principles of following processes: Halogenation, Alkylation,	25%
II	Oxidation, Hydrogenation, Nitration, Sulphonation,	25%
III	Hydrolysis , Esterification,Hydration.	25%
IV	Synthesis Based on Carbon Monoxide and Hydrogen.	25%

Basic Text & Reference Books:-

- Unit processes in organic synthesis, Groggins, Tata Mgraw Hill pub. 5th edition
- Chemistry of petrochemical processes, Sami Mater, Lewis Hatch, Gulf Professional pub. 2nd edition
- Industrial Organic Chemistry, K. Weissermal, H.J.Arpe, Wiley VCH. 4th edition
- Chemistry and technology of basic organic and petrochemical synthesis, N.N. Lebedev, Mir pub..



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Course Type	Course Code	Name Of Course	Theory/Practical	Credit	Contact Hrs/Week	Exam Duration in hrs	Component of Marks		
							Internal	External	Total
							Total/ Passing	Total/ Passing	Total/ Passing
Core Course	PS03CPST07	Polymer Composites, Blends &Adhesives	Theory	4	4	3	30	70/28	100/40
	PS03CPST08	Rubber Technology	Theory	4	4	3	30	70/28	100/40
	PS03CPST 09	Fiber Technology	Theory	4	4	3	30	70/28	100/40
	PS03CPST04	Practical: Synthesis of Polymers	Practical	4	6	3	30	70/28	100/40
	PS03CPST05	Practical: Advanced Polymer Processing	Practical	4	6	3	30	70/28	100/40
	PS03CPST06	Comprehensive Viva Voce			1	--	--	--	50/20
Elective Course (Any One)	PS03EPST03 OR PS03EPST04	Sophisticated Instrumental Analysis OR Polymer Processing Tool Design	Theory	4	4	3	30	70/28	100/40



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Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST04	Total Credit: 4
Title Of Paper: Practical - Synthesis of Polymers	

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



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST05	Total Credit: 4
Title Of Paper: Practical - Advanced Polymer Processing	

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



SARDAR PATEL UNIVERSITY
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Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST06	Total Credit: 1
Title Of Paper: Comprehensive Viva	

Unit	Description in detail	Weightage (%)
I	Comprehensive Viva Based on Core & Elective Courses of Semester.	100%



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST07	Total Credit: 4
Title Of Paper: Polymer Composites, Blends & Adhesives	

Unit	Description in detail	Weightage (%)
I	Composites: Introduction to composite materials, definitions, classifications, applications, advantage and disadvantages of composites, types of mold for composites and preparation of molds, release agents, core materials, coupling agents, fillers and pigments, gel coats, equipments and tools used for preparation of composites, Sheet moulding compounds (SMC), Dough moulding compounds (DMC) and Prepregs	25%
II	Processing of Composites: 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, Troubleshooting and remedies for composite processing.	25%
III	Compatibilization: Practical compatibilization, factors affecting miscibility, compatibilization by Physical processes, Physical additives, polymer modifications for physical compatibilization, reactive compatibilizers and reaction mechanism.	25%
IV	Adhesives: Concepts and terminology, Classification of adhesives, advantages and disadvantages of adhesives bonding, joint design, adhesive selection, adhesive properties surface preparation and bonding process. Solvent cementing of thermoplastics, cementing of thermosetting Polymer, Welding of thermoplastics, Ultrasonic assembly.	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.
- Plastics Engineering, R.J. Crawford, Maxwell Macmillan International, New York.
- FRP technology- Fiber reinforced Resin systems, Weatherhead, Applied Science, and London.
- Handbook of Reinforcements for plastics, Milewski Katz, Van Nostrand Reinhold, New York.
- Polymer Engineering Composites, M.C. W Richardson, Published by Applied science, London.
- Multi component polymer systems, I.S. Miles and S. Rostami, Chapman & Hall, New York.
- Polymer blends and Alloys, G.O. Shonaika 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.
- Adhesives Handbook, Butterworth's, J. Shields.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST08	Total Credit: 4
Title Of Paper: Rubber Technology	

Unit	Description in detail	Weightage (%)
I	General Introduction to Individual Rubbers: Introduction & general properties of rubber, Manufacture, structure, properties and application of Styrene butadiene rubber(SBR), Isoprene rubber, Butadiene rubber(BR), Ethylene – propylene rubber, Chloroprene rubber, Acrylonitrile – butadiene rubber, Butyl rubber.	25%
II	Specialty Rubber: polyurethanes, Fluorocarbon rubbers, Epichlorohydrin rubber, Polysulphide rubber, Silicon rubber Manufacture, properties, and application of different thermoplastics elastomers.	25%
III	Rubber Processing: Processing of field latex, preserved filed latex, latex concentrate, Ribbed smoked sheets, technically classified rubber, superior processing rubber etc.	25%
IV	Rubber Compounding and Chemistry of Vulcanization: Introduction, vulcanizing agents, Vulcanizing accelerators, Fillers, antidegradents, softners, plasticizers, processing aids etc. relation between curing system and properties.	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.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03CPST09	Total Credit: 4
Title Of Paper: Fiber Technology	

Unit	Description in detail	Weightage (%)
I	Introduction to fiber Technology: Defination of fibres, Classification and nomenclature of fibres, Definition of various textiles terms, structure principles of fibre forming polymers, Principles of finishing and dyeing of manmade fibre.	25%
II	Natural & Synthetic fiber: Introduction, Cotton, Rayon, Cellulose acetate, Wool, Polyamide, Acrylic fibre, Polyethylene terephthelate, Polyolefines, Spandex, Glass, Asbestos, Steel fibres.	25%
III	Spinning & Finishing of fiber: Introduction, Melt spinning, Solution spinning, Dry spinning, Gel spinning, Wet spinning	25%
IV	Textile Material for Rubber Reinforcement: Introduction, Basic classification, Definition of fundamental concepts and properties of textile reinforcing material, Production of cord and fabrics, Adhesive and heat treatment, Reinforcing system of individual rubber products, Testing methods for cord and fabrics.	25%

Basic Text & Reference Books:-

- Manmade fibres by R.W. Moncrieff
- Modern Textiles by Dorothy Lyle
- Essentials of Textiles by M.J. Joseph
- Physical Methods of Investigating textiles by R. Meredith and J.W.S. Hearle
- Textile fibres and their use by K.P. Hess
- Textile – Fibre to Fabric by B.P. Corbman
- Dying and chemical technology by E.R. Trotman
- International fibre science and technology series Vol. 5.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03EPST03	Total Credit: 4
Title Of Paper: Sophisticated Instrumental Analysis	

Unit	Description in detail	Weightage (%)
I	Elementary principles, Instrumentation, sampling methods and application of FTIR, ¹ HNMR, ¹³ C NMR ,	25%
II	Mass Spectrometry for the structural elucidation of organic compounds. Introduction to 2D-NMR and LC-MS/MS	25%
III	Theory, Instrumentation and applications of HPLC, HPTLC	25%
IV	Introduction and instrumentation of Atomic Absorption spectroscopy, XRD & SEM with special emphasis on polymer & pharmaceutical products.	25%

Basic Text & Reference Books:-

- Organic Spectroscopy, William Kemp, ILBS 3rd edition
- Spectrometric identification of organic compounds, Silverstein, John Wiley pub. 6th edition.
- Applications of absorption spectroscopy of organic compounds, J.R. Dyer. 10th reprint.
- Instrumental methods of chemical analysis, B.K. Sharma, Goel pub., 26th edition.
- Instrumental Methods of analysis, Willard and Dean, CBS, 7th edition.
- Spectroscopy of organic compounds, P.S. Kalsi. Wiley eastern ltd.
- HPTLC, D. Sethi, CBS 2nd edition.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03EPST04	Total Credit: 4
Title Of Paper: Polymer Processing Tool Design	

Unit	Description in detail	Weightage (%)
I	Mould making: Introduction, Common machine tools, Processes employed for mould making, machine tools, Casting, Electro-deposition, cold hobbing, pressure casting, spark machining, bench fitting, Materials for mould making, CAD/CAM.	25%
II	Injection mould Design: General Mould construction, Basic terminology mould cavities, Materials and process employed for mould making, General mould construction- types of injection moulds, cavities and core, bolsters, ancillary items, mould mounting, attachment of mould to the plate, Ejection: Ejector grid, ejector plate assembly, Ejection techniques, Sprue pullers.	25%
III	Feed system- runners and gates design. Venting and Parting surfaces, Mould cooling and shrinkage allowances on moulds: Cooling of integer moulds, insert moulds, insert -bolster assembly and mould cooling plates, Runner less moulds- nozzle types, hot runner unit mould, insulated runner mouldand hot runner plate mould, Runner less injection moulding.	25%
IV	Die Design: Screw extruder fundamentals, general features of die, Material and process for die making, design features of dies, Design procedure, Die geometry, Extruder –Die operations, heating systems, temperature control, ease of maintenance and cleaning, fabrication, and cost estimation	25%

Basic Text & Reference Books:-

- Injection moulding Handbook, Dominick. V. Rosato and Donald .V. Rosato, CBS Publishers &, New Delhi.
- Plastics Extrusion Technology Handbook, Sidney Levy and James F. Carley, Industrial Press, New York.1989.
- Polymer Processing, Morton & Jones, Chapman & Hall.
- Dies for Extrusion, M.V. Joshi, Mcmillan Ltd.
- Injection mould Design, R.C. W. Pye, Longman Scientific & Technical.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: June-2013

Course Type	Course Code	Name Of Course	Theory/Practical	Credit	Contact Hrs/Week	Exam Duration in hrs	Component of Marks		
							Internal	External	Total
							Total/ Passing	Total/ Passing	Total/ Passing
Core Course	PS04CPST11	Industrial Hygiene & Safety (Revised) (Effect From November/December-2013)	Theory	4	4	3	30	70/28	100/40
	PS04CPST08	Polymer Rheology	Theory	4	4	3	30	70/28	100/40
	PS04CPST09	Specialty Polymers	Theory	4	4	3	30	70/28	100/40
	PS04CPST10	Practicals–Project Work (Revised) (Effect From November/December-2013)	Practical	8	16	6	60	140/56	200/80
	PS04CPST06	Comprehensive Viva Voce		1	--	--	--	50/20	50/20
Elective Course (Any One)	PS04EPST05 OR PS04EPST04	Petrochemicals (Revised) (Effect from November/December-2013) OR Selected topics in Industrial Chemistry	Theory	4	4	3	30	70/28	100/40



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: June-2013

Paper Code: PS04CPST06	Total Credit: 1
Title Of Paper: Comprehensive Viva	

Unit	Description in detail	Weightage (%)
I	Comprehensive Viva Based on Core & Elective Courses of the Semester.	100%



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: June-2013

Paper Code: PS04CPST08	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. 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%
II	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%
III	Measurements of flow properties & Individual polymers: Mixing equipments, concentric cylinder rheometer, Cone and plate rheometer, Capillary rheometer, Parallel disc rheometer, torque rheometer, rheo-optics.	25%
IV	Rheology of Individual Polymers: 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.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: June-2013

Paper Code: PS04CPST09	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, Semi-synthetic 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.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: November/December-2013

Paper Code: PS04CPST10	Total Credit: 8
Title Of Paper: Practicals/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%



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: November/December-2013

Paper Code: PS04CPST11	Total Credit: 4
Title Of Paper: Industrial Hygiene & Safety	

Unit	Description in detail	Weightage (%)
I	Concept of Industrial safety, Accident causes & prevention, Safety committee and policies, Accident Investigation and Analysis.	25%
II	Types of chemical hazards and control, Control techniques, Process flow chart and its importance for safety inspection, Interpretation, use and training of MSDS, UN, HAZCHEM classification of chemicals, chemistry of fire.	25%
III	Transportation of hazardous chemicals, storage hazards and controls, hazards & control in unit processes and unit operations. safety work permit, safety of pipe lines, transportation of hazardous chemicals, safe start up & shut down procedures, emergency shut down.	25%
IV	Personnel protective equipments, house keeping, toxicology. Safety in Chemical Industry: General; Type of chemical hazards	25%

Basic Text & Reference Books:-

- Accident prevention manual for industrial operations, national safety council, Chicago, 10th edition.
- Safety and accident prevention in chemical operation, 2nd edition, Howard H.,
- Handbook of occupational safety and health, Lawrence S.
- MSDS, your guide to chemical safety
- Engg design for control of work place hazards, Richard A.
- Safety managers Handbook, J.J. Keller and Associates Inc. USA.
- Supervising safety for Hazardous Processes, Dr.K.U.Mistry, Safety Health and Environment Association, 1st edition.



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: June-2013

Paper Code: PS04EPST04	Total Credit: 4
Title Of Paper: Selected Topics in Industrial Chemistry	

Unit	Description in detail	Weightage (%)
I	GMP & GLP	25%
II	Green Chemistry: Principles, tools and examples of green chemistry	25%
III	Metabolism of carbohydrates, lipids and protein molecules	25%
IV	Forensic Science chemistry: Introduction, forensic chemistry, illicit drugs, forensic toxicology	25%

Basic Text & Reference Books:-

- Green Chemistry: Theory and Practice, Anastas, Warner, Oxford Univ. Press
- Forensic Science-the basics, Jay Siegal
- Good manufacturing practices for pharmaceuticals, Willing, S.H., Marce Dekker Pub., 1st edition
- Modern Organic Chemistry, Sharma & Jain, Goel Publishers



SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Polymer Science & Technology)
Semester: IV
Syllabus with Effect from: November/December-2013

Paper Code: PS04EPST05	Total Credit: 4
Title Of Paper: Petrochemicals (Revised)	

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.

