GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)
POLYMER & RUBBER MATERIALS – I
SUBJECT CODE: 2153602
B.E. 5th SEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied subject PR-04(Polymer & Rubber Materials- I) basic knowledge of the material which are types of polymer and rubber

Rationale: The main objective of this subject is to study the various materials which are included in rubber & polymers in chemical industries. This subject provides fundamental knowledge of various materials and how they are synthesis and what are the basic properties of materials in rubber & polymers in chemical industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
01.	**Ethylene** Polyethylene – LLDPE, LDPE, HDPE, ULDPE; Polypropylene & copolymer of propylene with ethylene, including ethylene – propylene – rubber, polyisobutylene, modified polyethylene.	8	16
02	**Vinyl Chloride** Polyvinyl chloride, copolymers with vinyl acetate, vinyl alcohol, maleic anhydride etc.; polyvinylidene chloride.	7	14
03	**Styrene Polymers** - polystyrene, HIPS, SAN, ABS, important copolymers of styrene with maleic anhydride & acrylics. Toughening of thermoplastics & mechanism of the same. Thermoplastic elastomers	8	16
04	**Polyesters** PET, PBT, PTT.	5	10
5	**Polymamides** – Nylon 6, Nylon6.6, Nylon11, aromatic polyamide such as Kevlar, Polycarbonates, polyoxymethylene i.e. Polyacetal. Acrylic polymers-polyacrylic acid, polyacrylamide, PMMA, ASA, Polyacrylonitrile etc.	9	18
6	**Liquid Crystalline Polymers**, specialty plastics- PES, PAES,PEEK,PEAK etc.	7	14

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
52.8%	**8.8%**	**8.8%**	**8.8%**	**8.8%**	**12%**

Reference Books:

1) Text book of Polymer Science, Billmeyers, John Wiley & Sons 1984.
2) Encyclopedia of Polymer Science & Technology, John Wiley & Sons, Inc 1965
3) Encyclopedia of Polymer Science & Engineering, John Wiley & Sons, Inc 1988
4) Polymer Chemistry Oxford University Press, Malcolm P. Stevens, Inc, 1990
5) Introduction to Polymer Science & Technology H.S.Kaufman & J.J.Falcetta, Wiley – Interscience Publication, 1977
6) Introduction to Rubber Technology, Andrew Ciesielski, RAPRA Publications, 2000
7) Rubber Technology, Maurice Morton, Springer, 1st Ed, 1987
8) The Science and Technology of Rubber, Mark and Erman, Academic Press, 3rd Ed, 2005

Course Outcome: After learning this course the students can:

1) To get knowledge of how the materials are synthesis and what are the raw materials used for the preparation of the materials in Polymer & Rubber Technology.
2) To be able to apply this knowledge in Polymer & Rubber industries.
3) To build a bridge between theoretical and practical concept used in industry.

List of Experiments:

1. Exploring a drug substance.
2. To calculate the assay, purity of a USP solution of reagent
3 To determine the percentage of Sodium Chloride in saline water
4. To determine the iron content in an iron tablet
5. To calculate the assay of Vitamin C
6. Extraction of Caffeine from tea leaves
7. Synthesis of Aspirin
8. Synthesis of a drug intermediate.
9. Monitoring of reaction by thin layer chromatography
10. To find out the concentration of solutions by UV spectroscopy.

Design based Problems (DP)/Open Ended Problem:

Application and utility of NITRATION as unit process in Chemical Technology

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.