GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (23)
PLASTICS RECYCLING & WASTE TREATMENT
SUBJECT CODE: 2152303
B.E. 5th SEMESTER

Type of course: Core

Prerequisite: NA

Rationale: NA

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	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Polymer Chemistry : Sources of raw materials – Monomers –Polymers – Polymerisation - Types of Polymerisation – Classification. Functionality and concept of functionality ;	5	10
2	NATURAL POLYMERS: 1.CARBOHYDRATES: Cellulose – principle sources, various forms, extraction, physical, mechanical and chemical properties, Applications. Cellulose modifications – preparation, properties and application of viscous rayon, cupra- ammonium rayon, cellulose acetate, cellulose nitrate, ethyl cellulose, carboxyl methyl cellulose, starch and legnin. 2. Proteins: Structure, properties and application of nucleic acids, casein, wool, silk, shellac, rosin, fossil resin. 3. Natural rubbers: Extraction, structure of latex, conversion of latex into smoke rubber, compounding of rubber. Structure, preparation, properties and application of chlorinated rubber, hydrogenated rubber and cyclo rubber	10	10
3	Chemistry of Free Radical, Ionic, Condensation Polymerisation.	10	15
4	Chemistry of Thermoplastic materials like POLYOLEFINS[PE: LDPE/HDPE/LLDPE/MDPE/UHMWPE] , PP , PS, ETC. Chemistry of ABS, PC, Nylons [6, 66,etc] , Polyacetals, PPS, PEEK, PTFE, etc. in detail.	15	35
5	Chemistry of Thermosets : Phenol formaldehyde , Melamine Formaldehyde, Urea Formaldehyde, Alkyd resins, Epoxies ,etc	10	20
6	Chemistry v/s. Polymer Properties : Study with both thermoplastics and Thermoset materials	4	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**20**	**15**	**10**	**--**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Introduction to Polymer Chemistry by G.S.Misra
2. Polymer Chemistry by M.G.Arora and M.Singh
3. Organic Polymer Chemistry by K.J.Saunders.
4. Physical Chemistry of Polymers by D D Deshpande
5. Physical Chemistry of Polymers by A Tager

Course Outcome:

After learning the course the students should be able to:

1. To become through with the chemistry of plastic materials.
2. To be able to design new polymers by varying chemistry

List of Experiments and:

1. Determination of Saponification values of plasticizer and raw material of polymer.
2. Determination of acid values of polymers.
3. Determination of Hydroxyl value of polymer.
4. Determination of iodine value of polymer.
5. Determination of percentage loss due to pyrolytic degradation of PVC.
6. To study the degradation of Nylon – 66 by chemical method.
7. To estimate amount of formaldehyde in the given formaldehyde Sample.
8. To estimate percentage purity of phenol.
9. To estimate percentage purity of Styrene.
10. Toestimate melamine content.

Design Based (DP)/Open Ended Problems:

To develop new plastic materials by varying chemistry and synthese in laboratory

Major Equipment:

Glass ware, heating mantles, etc

List of Open Source Software/learning website:

www.wikipedia.org

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.