GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (26)
CORROSION OF POLYMERS & ELASTOMERS
SUBJECT CODE: 2162606
B.E. 6thSEMESTER

Type of course: B. E. Rubber Technology

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	3	6	70	20	10	20	10	20	150

Content:

Sr. No	Course Content	Total Hrs	% Weightage
1.	Introduction: Permeation, Absorption, Corrosion of Polymers, Mechanisms of corrosion, Corrosion resistant properties of various materials, Proper fabrication and installation techniques, Methods to prevent or control corrosion, Corrosion testing techniques, Corrosion monitoring techniques.	9	15
2.	Polymer types and Polymer synthesis & processing: Introduction, Crystallization, melting and glass transition, Mechanical behavior of polymers, Mechanisms of deformation and strengthening of polymers, Characteristics and typical applications of few polymeric materials.	9	20
3.	Thermoset Polymers: Corrosion of Thermosets, Joining of Thermosets, Ultraviolet Light Stability,Reinforcing Materials, Halogenated resins, Epoxy-based thermosets, Corrosion Resistance, vinyl ester class of resins, Furan polymers, Phenolics, Siloxirane, Melamines, Alkyds, Ureas (Aminos), Allyls, Polybutadienes, Polyimides, Cyanate Esters.	9	15
4.	Comparative Corrosion Resistance of Thermoplastic & Thermoset Polymers.	5	15
5	Elastomers: Importance of Compounding, Similarities of Elastomers and Thermoplastic Polymers, Differences between Elastomers and Thermoplasts, Causes of Failure, Selecting an Elastomer, Corrosion Resistance, Applications, Resistance to Sun, Weather, and Ozone of different rubbers, Chemical Resistance of different rubbers.	10	15
6	Surface Engineering for Corrosion and Wear Resistance: Corrosive Wear, Methods to Control Corrosion, Methods to Control Wear, Material/Process Selection.	12	20

Suggested specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	15	15	15	0

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. Corrosion of Polymers & Elastomers by Philip A.Schweitzer.
2. C. A. Harper, Handbook of Plastics ,Elastomers and Composites.
3. Rubber Products Manufacturing Technology by Hertz, Jr., D.L.
4. General Purpose Elastomers: Structure, Chemistry, Physics and Performance by Robert A. Shanks and Ing Kong

Course outcome:

After learning the content of the subject the students will be able to:

1. Know about the Mechanisms of corrosion.
2. Learn about Corrosion resistant properties of various materials.
3. Able to understand the Proper fabrication and installation techniques.
4. Understand the Mechanical behavior of polymers.
5. Know about the Mechanisms of deformation and strengthening of polymers.
6. Learn about the Characteristics and typical applications of few polymeric materials.
7. Compare the Corrosion Resistance of Thermoplastic & Thermoset Polymers.
8. Learn the importance of Importance of Compounding.
9. Learn about Surface Engineering for Corrosion and Wear Resistance.
10. Know & study about Methods to Control Corrosion & Wear.

List of Experiments:

Tutorials/Presentation/Practicals based on above topics

Design based Problems (DP)/Open Ended Problem:

- Noncorrosive nitrile elastomers.
- The Degradation effects of Pyrolysis Liquids on Metals, Plastics & Elastomers.
- Elastomer Compounds & Chemical Compatibility.

Major Equipments:

Tensile Tester, Hardness Tester, Oven, Ozone Test Chamber etc.

List of Open Source Software/learning website:

- http://onlinelibrary.wiley.com/
- http://aea-al.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.