GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (23)
POLYMER ALLOYS AND BLENDS
SUBJECT CODE: 2182302
B.E. 8TH SEMESTER

Type of course: Core

Prerequisite: IPMS, MTP, Chemistry of Plastics

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)		PA (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: Alloying & blending -definition-need to alloy & blend polymers-polymer that can be blended-introduction to composites-raw material selection criteria.	**5**	10%
2	Alloys & blends. Introduction: historical outline of industrial development of polymer alloys and blends-definitions-the reasons for and methods of blending-how to select blend components-fundamental principles for development of polymer alloys and blends.	**6**	10%
3	Polymer-polymer miscibility: general principles of phase equilibria calculation-theories of liquid mixtures containing polymer: Huggins-Flory theory, eqt. of state theories, Gas-lattice model, etc; Mechanisms of phase separation-general types of Polymer blends-polymer crystallization-morphology of blends-measurement of polymer/polymer interaction.	**7**	20%
4	Blend preparation equipments: mixers' and their various types like banbury, hot and cold mixers, twin screw compounders, and two- roll mills, etc. Design features of these equipments like rotor types, screws and their various types; flow behavior of the plastic material in the mixing equipments, theory of mixing etc.	**10**	20%
5	Characterization of Blends: characterization techniques like differential scanning Calorimetry, UVIR, FTIR, scanning electron micrographs, etc.	**10**	15%

6	Commercial polymer alloys and blends: blends of engineering and commodity plastics like PVC/ABS, PVC/SAN, PVC/NBR, PC/PET, PC/PBT, PC/ABS; PPO/HIPS etc. study in detail along with properties and applications.	**14**	25%

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 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. Polymer Alloys and Blends by L.A.Uttracki
2. Polymer Engineering and Science Encyclopedia

Course Outcome:

After learning the course the students should be able to:

1. Understand concepts of polymer alloying and blending.
2. Understand the compatibility of various systems of polymers.
3. Identify which testing methods to be used for polymer alloys and blends.

List of Experiments:

1. To understand basics of blending and alloying of plastics.
2. To study compatibilisation of Polymer Blends
3. To study Flory Huggins Theory
4. To Study the Gas Lattice model
5. Discuss Morphology of Polymer Blends
6. Discuss about Banbury mixers in detail.
7. Discuss about twin screw compounders used for alloying and blending
8. Discuss Differential Scanning Calorimetry
9. Discuss about UVIR
10. Discuss about role of SEM in blending and Alloying
11. Discuss about FTIR

Design based Problems (DP)/Open Ended Problem:

1. To Prepare blends of PVC/NBR
2. To Prepare blends of PC with commodity plastics
3. To Prepare blends of ABS with commodity thermoplastics

List of Open Source Software/learning website:

1. **www.wikipedia.org**
2. **www.sciencedirect.com**
3. **www.mit.edu**

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 be submitted to GTU.