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 Plastic Waste	2	5
2	Sources of Plastic Wastes: • Generation of industrial plastic wastes. • Plastics in solid wastes. • Future of waste disposal.	4	6
3	Separation of Component of Municipal Refuse: • Separation processes.	4	6
4	Primary Recycling: • Degradation of thermoplastics. • Industrial practices.	4	10
5	Secondary Recycling: • Approaches to secondary recycling. • Chemical modification of mixed plastic waste • Secondary recycling by Co extrusion & Injection molding.	4	10
6	Use of Waste Plastic as Filler.	3	3
7	Tertiary Recycling: • Chemicals from waste: 1. Pyrolysis 2. Chemical decomposition.	4	10
8	Quaternary Recycling: • Energy from plastic waste: Introduction 1. Incinerator 2. Energy recovery from municipal refuse. 3. Its effect on reuse.	6	10

	4. Treatment of predominantly plastics waste.		
9	Disposal of Waste Plastics without Recovery of Value: 1. Incineration without recovery of energy. 2. Plastic in land filled.	4	5
10	Recycling of Various Plastics: 1. HDPE 2. Acrylics 3. PET 4. PVC 5. Engg. Plastics 6. Medical Plastics	3	10
11	Emerging Trends in Recycling.	3	3
12	Instrumentations and Control Used for Recycled Products.	2	2
13	Biodegradation of Plastics: 1. Application of biodegraded plastics. 2. Classification, preparation and utilities of degradable plastics. 3. Studies in starch filled plastics, 4. Studies in jute &other natural fiber filled plastics. 5. Collection and segregation of biodegradable plastics.	4	10
14	Plastics and Environment: 1. Environment consciousness. 2. Environment education & awareness programmers. 3. Environmental policies, legislation & code of protection.	3	10
15	Recycling of Co- extruded film.	2	2
16	Recycling of Medical Waste.	2	3

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. Plastic waste, Recovery of Economic Value by Jacob Leidner —
2. Plastics Waste as Potential Source of Energy by O.P. Ratra.
3. Recycling of PVC & PVC Rich fractions from Mix plastics. By M. Sender, Institute of materials publication

Course Outcome:

After learning the course the students should be able to:

1. Understand the recycling methods for plastics
2. Identify various types and suggest suitable methods to recycle

List of Experiments and Design Based (DP)/Open Ended Problems: :

1. To Study the primary recycling methoods for plastics
2. To Study the secondary recycling methods for plastic materials.
3. To estimate the process parameters for the recycling of PET WASTE
4. To estimate the process parameters for recycling of LDPE film waste.
5. To develop usable products using various percentage of plastic waste and test the properties.
6. To develop simple techniques for conversion of plastic waste to monomer.
7. To study the tertiary recycling of plastic materials.
8. To develop working models for recycling of plastic waste
9. To develop process parameters for recycling of PP WASTE
10. To study the reactive Extrusion process

Major Equipment:

1. Single screw extruder with all attachments
2. Twin screw extruders: co rotating and counter rotating types
3. Grinders
4. Two roll mill
5. Compression press
6. Testing machines like tensile, flexural, impact testers

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.