

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Plastic Engineering (23)
SUBJECT NAME: Speciality Plastics and Applications
SUBJECT CODE: 2172307

B.E. 7TH SEMESTER

Type of course:

Prerequisite: IPMS, Chemistry of Plastic Materials

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		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

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Learning Objectives: To enable learning of Speciality Plastic Materials, their properties, applications.

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	General introduction. Introduction- High Performance Plastics definition, Definition of Speciality plastics, commercially available speciality and high performance plastics, Engineered plastics, plastics for specific industry like medical, automotive, textile, Dairy, Machine tools,etc. Selection Criteria	5	5
2	HIGH PER FORMANCE PLASTICS: PEEK, PES, LCP, PTFE, POLYIMIDES, PAI/ PPS/ PEI/ E CTFE/ PPE, etc. Chemistry, properties, applications of each of these	7	10
3	Plastics used in Medical Applications: Material Requirements for Plastics used in Medical Devices Introduction, Material Characterization, Sterilization, Chemical Resistance, Biocompatibility, USP Class VI, ISO 10993, Shelf Life	7	10

	and Aging & Joining and Welding. Polymer Additives Used to Enhance Material Properties for Medical Device Applications Introduction, Types of Additives, Things to Consider When Using Additives, Plasticizers, Wear-Resistant and Lubricious Additives, Pigments, Laser Marking, Radiopaque Additives, Antimicrobials, Conductive Fillers, Nanoadditives & Stabilizers. PLASTICS IN DRUG DELIVERY		
4	<u>PLASTICS USED IN AUTOMOTIVE INDUSTRIES:</u> Selection Criteria, requirements of materials, Plastics like PP, PU, PVC, PET, PBT, ABS, NYLON6, PE, POM [POLYOXOMETHYLENE], PC, PMMA, ASA (acrylonitrile styrene acrylate). Chemistry, properties, applications.	7	10
5	<u>PLASTICS USED IN AEROSPACE/AVIATION INDUSTRY:</u> Requirements in Aerospace/Aviation, Selection Criteria, Plastics like FLOROPOLYMERS, PI, PEEK, PPS, PPSU, PEI, PPP, ETC. Chemistry, properties, applications.	7	10
6	<u>Plastics in Construction Industry</u> : Requirements in Marine Industry, Selection Criteria, Plastics like PVC, CPVC, PU, EPOXY, PC, ABS,ETC. CHEMISTRY, PROPERTIES, APPLICATIONS	6	10
7	<u>PLASTICS IN MARINE INDUSTRY:</u> REQUIREMENTS, selection criteria, Plastics like Acrylics, Acetals, Polyethylenes, foams, PP, uhmwpe, etc. Chemistry, properties, applications.	6	
8	<u>PLASTICS IN SEMICONDUCTOR INDUSTRY</u> : REQUIREMENTS, selection criteria, Plastics like PVDF, PP, PTFE (polytetrafluoroethylene); FEP (fluorinated ethylene propylene); PFA (perfluoroalkoxy), ECTFE (ethylene chlorotrifluoroethylene) and PCTFE (polychlorotrifluoroethylene) , ETC	6	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks							
Remembrance	Understanding	U	Application	A	Analyze	Evaluate	E
R Level	Level		Level		N Level	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

Textbooks:

- 1. High Performance Polymers and Engineering Plastics, Vikas Mittal (Editor), Wiley**
- 2. Practical Guide to High Performance Engg. Plastics, By David J. Kemmish, RAPRA**

References:

- 1. Wikipedia**

Course Outcome:

After learning the course the students should be able to:

1. Know about speciality and high performance plastics.
2. Know various applications of high performance plastics in specific industries

List of Experiments:

- 1. To study the properties and applications of PEEK**
- 2. To study properties and applications. Of Fluoro polymers.**
- 3. To study properties of sulphone based polymers.**
- 4. To study properties and applications of IMIDE polymers.**
- 5. To study properties and applications of ACETALS.**
- 6. To study Medical plastics and do tests to comply for medical applications.**
- 7. To study plastic applications in semiconductor industry.**
- 8. To study applications of plastics in Cosntuction industry.**
- 9. To study applications of plastics in Defence.**
- 10. To study applications of plastics in Marine**

Design based Problems (DP)/Open Ended Problem:

Major Equipment: 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 submit to GTU.