

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Plastic Technology (23)

SUBJECT NAME: Adhesives and sealants

SUBJECT CODE: 2172306

B.E. 7TH SEMESTER

Type of course: ELECTIVE

Prerequisite: CHEMISTRY OF PLASTIC MATERIALS, IPMS

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 | 3 | 6 | 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 educate students on the importance of relationship of Plastic Structure with properties and applications of plastics

Content:

| Sr. No. | Content | Total Hrs | % Weightage |
|---------|---|-----------|-------------|
| 1 | Fundamentals of Adhesives Introduction to Adhesives, the role of Adhesives in the economy, fundamentals of adhesion, surface preparation for adhesion bonding, adhesive selection and screening. | 5 | 5 |
| 2 | Natural Adhesive Materials Animal glue, casein and mix protein adhesives, starch base adhesives | 5 | 5 |
| 3 | Rubber Base Adhesive Material Natural rubber adhesive, butile rubber and polyisobuteline, nitrile rubber adhesive, styeren butadiene rubber adhesive, thermoplastic rubber in adhesive, carboxylic polymers in adhesive, neo prene based solvent and latex adhesive, polysulfide sealant and adhesives. | 5 | 10 |

| | | | |
|----|--|---|----|
| 4 | Resin Based Adhesives Phenolic resin adhesive, amino resin adhesive, epoxy resin adhesive, Polyurethane & isocyanate based adhesive | 5 | 10 |
| 5 | Polyvinyl Based Adhesive Polyvinyl acetate emulsions for adhesives, polyvinyl alcohol for adhesives, polyvinyl acetal adhesive | 5 | 10 |
| 6 | High Performance Based Adhesive polyester and polyamide high performance hot melt adhesives, high temperature organic adhesives, silicone adhesives sealants and abrasives, organofunctional silane coupling agents, non-silance coupling agents, resins for elastomer based adhesives, polyolefin and ethylene copolymer based hot melt adhesives, acrylic adhesives, anaerobic adhesives, cyanoacrylate adhesives. | 7 | 10 |
| 7 | Bonding Technology : Bonding plastics, bonding textiles to rubber, bonded adhesives | 5 | 10 |
| 8. | Adherends And Bonding Technology Wood adhesive, sealants and caulks, pressure sensitive adhesives for taps and labels, coated abrasives. | 7 | 10 |
| 9 | Adhesives For Industrial Application Adhesives for building construction, adhesives in electrical industry, conductive adhesives, structural adhesives in aerospace industry, adhesives in automobile industry, Meter, Mix & dispersing equipments-basic design, robotic dispersing of sealants and adhesives. | 7 | 30 |

Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | |
|-------------------------------------|----------------------------------|--------------------------------|----------------------------|-----------------------------|
| Remembrance R Level | Understanding Level U | Application Level A | Analyze N Level | Evaluate Level E |
| 15 | 15 | 20 | 10 | 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

Text Book:

1. Handbook of adhesives (Third edition) by Irving Skeist
(Publication- VAN NOSTRAND REINHOLD, NEW YORK)
2. Handbook of Adhesives and Sealants by Edward M. Petrie
3. Adhesives and Sealants: Technology, Applications and Markets by David J Dunn
4. Handbook of Adhesives and Sealants: Basic Concepts and High Tech Bonding

Phillipe Cognard

Course Outcome:

After learning the course the students should be able to:

1. **Understand and apply the knowledge of adhesives and sealants in practical life.**
2. **Know how to effectively use this knowledge to design new polymer systems**

List of Experiments:

1. **Develop Epoxy based adhesive in lab**
2. **Develop PU based adhesive in lab**
3. **Develop TPE based adhesive in lab**
4. **Develop adhesive for roofing applications**
5. **Develop sealants based on thermoplastics**
6. **Develop sealants based on thermoset materials**
7. **Develop Adhesives for furniture industry**
8. **Develop adhesives for piping systems**
9. **Study adhesives used by electronic industry**
10. **Study sealants used by pharmaceutical industries.**

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.