



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester 5 (Diploma)

Subject: Polymer Technology -DETC15217

Type of course: Professional Elective Courses

Prerequisite: Fundamental understanding of Chemistry

Rationale: To provide a broad and fundamental knowledge of polymers and their chemical, physical and mechanical behavior, emphasize polymer synthesis, reaction engineering, and various processing techniques like moulding and extrusion. To equip the students with the knowledge necessary for deciding which characterization technique(s) would be appropriate for determining properties of interest.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

Legends: CI - Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE - Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No.	Course content	Hrs	Weightage
1	Introductory Concepts and Definitions: Some definitions: Polymer, Monomer, Oligomer, Repeating Unit, Representation of Polymer Structures, End groups, Degree of Polymerization: Polymerization and Functionality, Copolymers: Random copolymers, Alternate copolymers, graft copolymers, block copolymers. Molecular Architecture, Thermoplastics, and Thermosets, Elastomers. Fibers, and Plastics, Polymer molecular weights, and molecular weight distribution, the practical aspect of molecular weight measurement. Configuration and crystallinity of polymers, Effect of polymer isomerism, and conformational changes.	12	20%



2	Polymer Synthesis and Reaction Engineering: Polymerization techniques: Addition polymerization: Bulk polymerization, solution polymerization, suspension polymerization, emulsion polymerization, Condensation polymerization: melt polycondensation	18	30%
3	Polymer Material Structure and Properties: Polymer structure and physical properties, Thermal transitions, Crystallization of polymers, Glass transition temperature, Viscoelastic behavior of polymers, Dynamic mechanical behavior at thermal transitions, Strain-stress tests, crazing in glassy polymers, Fracture mechanics, toughness and brittleness, polymer rheology, the effect of fabrication processes	15	25%
4	Manufacturing of Polymers: Polyethylene, polypropylene, polyvinylchloride and copolymers, polystyrene, polyamides, polyesters, Acrylics, Phenol-formaldehyde, Melamine-formaldehyde, Polyurethane, Epoxides, Rubbers and elastomers	15	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	Daily Use polymers manufacturing Process Explain Manufacturing process of any 3 daily use polymer, list of polymer will be provided by faculty to students, students must upload report on GMIU web Portal	10
2.	Poster Presentation of Polymer synthesis Make a poster on different polymer synthesis methods provided by faculty and upload them on GMIU web portal.	10
3.	Polymer industries in Gujrat Explore Polymer industries in different districts of Gujrat area and prepare a report on including the following topic- type of polymer producing, manufacturing process of polymer (faculty can provide specific production parameters to students/group of students). prepare report and submit on GMIU web portal.	10
4.	Simulation of any Polymer processing using DWSIM Run a Simulation of Polymer industry using DWSIM software, faculty will provide terms and conditions of simulation, students have to submit simulation report on GMIU web portal.	10
5.	Recent advancement in polymer industries Students have to prepare short communication on topic of polymer technologies and recent advancement using last one year research articles, and present in class. presentation will be submitted on GMIU web portal.	10
Total		50



Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	40%	30%	30%	0%	0%	0%

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.

Course Outcome:

After learning the course the students should be able to:	
CO1	Evaluate the different molecular weight and size of the polymers. Identify the various polymers
CO2	Understand the structure-properties relationship of polymeric materials. Decide which test methods are suitable for the measurement of various properties such as rheology and mechanical properties of polymers.
CO3	Understand the various mechanisms of polymerization and choose suitable techniques for polymer synthesis.
CO4	Identify various polymer processing techniques used for the fabrication of polymer-based products.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] F.W. Billmeyer, "Textbook of Polymer Science"
- [2] A. Kumar, "Fundamentals of Polymer Engineering"

