GUJARATTECHNOLOGICALUNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Plastics Engineering

Subject Code: ME02084081

Subject Name: Bioplastics

w.e.f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Plastic Materials
Rationale:	Nil

Course Outcome:

After Completion of the Course Student will able to:

No	Course Outcomes
01	At the end of this course the students will able to know the most relevant bio plastics from renewable and non-renewable origin
02	They will be able to understand the biodegradation behaviour and apply the principle ecotoxicological aspects in the biodegradation process of polymers.
03	Take into consideration aspects related to the biodegradation of bio plastics in different environments and the related standards and showingtheir use in helping to solve specific solid waste problems.
04	

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/ Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	%of Weightage
1.	**Introduction** Definition of biopolymers, biodegradable polymers, Classification of biodegradable polymers, biobased plastics, Advantages of biopolymers.	5	10
2.	**Degradation of polymers** – Mechanisms and Evaluation Methods Introduction, Defining Biodegradability,Mechanisms of Polymer Degradation-Non biological Degradation of Polymers and its types like Thermal degradation, Mechanical Degradation, Degradation by Ultrasonic Waves, Photo degradation, Degradation by High Energy Radiation, Oxidative Degradation and Hydrolytic Degradation. Biological Degradation of Polymers-Enzymic Hydrolysis, Enzymic Oxidation. Measuring Biodegradation of Polymers- Enzyme assays, Plate test, Respiratory test, Natural environment, Field trial, Gas evolution test, Factors Affecting Biodegradability:	10	10
3.	**Types of Biodegradable Polymers Bio based polymers**, Starch based polymers, Cellulose based polymers, Chitin and Chitosan, Bacterial Polyesters, Synthetic Biodegradable Polymers, Polymers from Bio Based Monomers	8	15
4.	**Biodegradation Behaviour of Polymers in Liquid Environments** Introduction, Degradation in Real Liquid Environments,Degradation in Laboratory TestsSimulating Real Aquatic Environments,Degradation in Laboratory Tests with Optimised and Defined Liquid Media,Standard Tests for Biodegradable Polymers Using Liquid Media **Biodegradation Behaviour of Polymers in the Soil** Introduction,How Polymers Reach Soil,The Soil Environment-Surface factors, Underground factors,Degradability of Polymers in Soil, Effects of Biodegradable Polymers on Soil Living Organisms	8	20
5	**Ecotoxicological Aspects in the Biodegradation Process of Polymers** Need of Ecotoxicity Analysis for Biodegradable Materials, Introduction to Ecotoxicology, Recommendations and	8	20

	Standard Procedures for Biotests, Special prerequisites to Be Considered When Applying Bioassays for Biodegradable Polymers,		
6	**General Characteristics, Processability**, Industrial Applications and Market Evolution of Biodegradable Polymers General Characteristics:Polymer Biodegradation Mechanisms,Polymer Molecular Size, Structure and Chemical Composition etc Processability:Extrusion,Film Blowing and casting,Moulding,Fibre spinning Industrial Applications:Loose-Fill Packaging,Compost Bags,other application Market Evolution	10	20
	Total	**100**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	15	20	10	5	5

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asper Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
Books:
1. Handbook of Biodegradable Polymers :CatiaBastioli
2. Biopolymers and biomaterials:Padinjakkara, Aneesa Souza, Fernando Gomes Thankappan,
3. Introduction to Bioplastics Engineering :Ashter, Syed Ali (z-lib.org)
4. Plastic Materials: J. A. Brydson

)Open source software and website:

1) https://nptel.ac.in/

2) https://www.bpf.co.uk/

Suggested Course Practical List: : As per the above syllabus topics

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