



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3162612

Semester – VI

Subject Name: Biodegradable Polymers

Type of course: Open Elective II

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	0	3	70	30	0	0	100

Content

Sr. No.	Content	Total Hrs
1.	The Basics of Biodegradable Polymers: General considerations, Biodegradability, Classification of biodegradable materials, Properties of Biodegradable Polymers.	05
2.	Polymer Biodegradation Mechanisms: Polymer Molecular Size, Structure and Chemical Composition, Biodegradable Polymer Classes, Natural Biodegradable Polymers, Synthetic Biodegradable Polymers, Modified Biodegradable Polymers.	06
3.	Measurement of polymer biodegradation: Principles, Applications and drawbacks : Enzyme Assays, Plate Tests, Respiration Tests, Gas Evolution tests, Radioactively Labeled Polymers, Laboratory-scale Simulated Accelerating Environments.	06
4.	Biodegradable polymer blends: Basic structure of biodegradable medical polymers, New concepts of biodegradable polymer blends, Biodegradable polymer hybrids.	06
5.	Microbial degradation of Natural Rubber (Isoprene): Isoprene: production, biosynthetic pathways, biological functions, and biotechnological potential, Microbial cycling of Isoprene, Anaerobic Biodegradation of cis-1,4-Polyisoprene, Biodegradation of trans-1,4-Polyisoprene.	08
6.	Microbial degradation of Synthetic polymers: Enzymatic activities for Poly(polyol sebacate) (PPS), Poly(glycerol sebacate) (PGS), Poly(xylitol sebacate) (PXS) and other PPS Elastomers, Photo polymerised poly(glycerol sebacate-co-acrylate) (PGSA), PGS-based elastomeric composites, Citric acid based Elastomers, Other biodegradable soft Elastomers.	08
7.	Environmental Fate and Ecotoxicity Assessment of Biodegradable Polymers: Introduction, End of Life Scenarios of Biodegradable Polymers, Investigation into Polymer	07



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3162612

	Biodegradation, Environmental Fate of Biodegradation Intermediates, Ecotoxicological Assessment of Biodegradation Intermediates.	
8.	Applications of Biodegradable Elastomers & Polymers: Emerging biomaterials for various medical applications ,drug delivery and tissue engineering, Preparation strategies, Design considerations, Degradation rate, Influence on properties during degradation.	08

Suggested Specification table with Marks (Theory): (For BE only)

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

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:

- Handbook of Biodegradable Polymers, Editor: Catia Bastioli, Smithers Rapra Technology Ltd.
- Science and Principles of Biodegradable and Bioresorbable Medical Polymers , Materials and Properties by Xiang Zhang.
- Biodegradation of Natural and Synthetic Rubbers by Alexandros Linos1, Alexander Steinbüchel.

Course Outcomes:

After learning this course students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Classify the various biodegradable Elastomers and polymers based on their properties.	10
CO-2	Explain the biodegradation mechanism for Natural and synthetic rubber along with other biodegradable polymeric materials.	15
CO-3	Analyze the different methods for measurement of Biodegradation in Elastomers and polymers.	15
CO-4	Justify the Environmental importance of and advantages of biological degradation.	15
CO-5	Develop the various biodegradable applications in field of rubber technology.	15



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162612

List of Open Source Software/learning website:

- <http://nopr.niscair.res.in/bitstream/123456789/5718/1/IJBT%204%282%29%20186-193.pdf>
- <https://www.mdpi.com/2073-4360/11/6/1066/htm>
- <https://www.ijpsonline.com/articles/biodegradable-polymers-which-when-and-why.html>
- <https://doi.org/10.1038/s41396-018-0072-6>
- <https://biomedres.us/pdfs/BJSTR.MS.ID.002056.pdf>