

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

PLASTIC TECHNOLOGY

Subject Name: **BIOPOLYMERS AND BIOPLASTICS**

Sr. No.	Course Contents	Total Hrs
1.	Introduction: Definition of Biopolymers and types of biopolymers, definition of bioplastics, Types of bioplastics, such as starch based, cellulose based plastics and some aliphatic polyesters (PLA, PHB), polyamides, Bio-Based Composites from Soybean Oil and Chicken Feathers, bio-derived polyethylene and genetically modified bioplastics. Environmental impact such as Bioplastics and biodegradation.	6
2.	Bioplastics and Biocomposites processing and their applications: Introduction of bioplastics and biocomposites, processing of bioplastics and biocomposites, applications of bioplastics and their composites- civil engineering, biomedical, automotives applications.	4
3.	Polymer biodegradation: Biodegradable polymer classes, Natural biodegradable polymer, Synthetic biodegradable polymer and modified naturally biodegradable polymer. Non-biological and biological degradable polymer. Measuring of biodegradation of polymers- Enzyme assays, Plate test, Respiratory test, Natural environment, Field trial, Gas evolution test (CO ₂ & CH ₄) Composite implant materials: Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Polymers filled with estrogenic fillers (e.g. hydroxyapatite). Host tissue reactions.	16
4.	Biomaterials in Medical and Dental Devices and Prostheses: Introduction of biomaterials, Material choice implications based on device design. General biomaterial evaluation procedures. Replacement of skeletal hard tissues. Polymer used as cosmetic implants, controlled drug delivery system artificial heart valves, bone replacement, artificial organs, dental applications.	6
5.	Surface Modification of Biomaterials for Improved Functionality: Enhancement of biocompatibility by the use of Corona discharge and plasma processes. Surface coatings Silver/silver oxide silicone hydrogels UV curable systems PC coatings Heparin loaded systems	6
6.	Characterization and Testing of Biomaterials: Bulk analysis methods applied to the study of Biomaterials (XRD, FTIR, DSC, TGA, etc.) Surface analysis methods applied to the study of biomaterials (SEM, TEM, AFM, etc.) Mechanical test: wear, friction, flexibility, fatigue, etc.	8
7.	Applications and manufacture of Bio Plastics Use of Bio materials for manufacture of plastic films, various types of films and applications; usage of biological friendly plastics in homes, industry, etc. with specific applications. Mixing of biomaterials with plastics: equipment details, process details etc.	8

Text Book:

1. D. Byrom, Biomaterials –novel materials from biological sources, Stockton press, NewYork,1991.
2. Catia Bastioli, hand Book of Biodegradable polymers (Rapra Tech.), ISBN: 1- 85957389-4
3. Surface modification of biomaterials: Methods analysis and applications Edited by R Williams, University of Liverpool, UK
4. Biopolymers, R.M. Johnson, L.Y. Mwaikambo and N. Tucker ISBN 978-1-85957-379-2
5. Srikanth Pillai- Hand Book of Bioplastics & Biocomposites for Engineering Applications

Reference Book:

1. Steinbuechel – Biopolymers.