BIOPOLYMERS

Unit I

Biopolymers- Definition, Importance, Classification, Biodegradable& Compostable polymers Polymers derived from renewable resources, Oils and fats of plant and animal origin, Hydroxylation (ring opening) of vegetable oil, vegetable oil as feedstock for Polyurethane polymers, properties and applications of botanically derived polymers. Polynucleotides [DNA, RNA]; Polypeptides [Collagen, Keratin, elastin etc.,]; Structural hierarchy and its importance Present scenario of Biopolymer based industries in India and Abroad

Unit II

Cellulose: Wood and other cellulose sources, Cellulose isolation, Use of native Cellulose, Cellulose properties, Dissolution of Cellulose, Use of regenerated Cellulose
Hemicelluloses: Sources and different chemical structures of hemicelluloses, Chemical derivatives of hemicelluloses, Properties and use of hemicelluloses and their derivatives, Actual market importance and future chances Chitin & Chitosan: Chemical structure, Sources and extraction of chitin, Extraction and characterization, Physico-chemical properties, Chemical modifications, Functional properties and applications- Film & coating applications

Unit III

Production, Chemistry & Properties of Polylactides, Production methods for Polylactides, Polycondensation of Lactic acid, solvent assisted polycondensation, chain extension of lactic acid based polymers, ring opening polymeristion, Properties & applications of PLA blends
Production, Chemistry & Properties of Poly hydroxyalkanoates, synthesis- bacterial biosynthesis of polyhydroxyalkanoates , Production by genetically modified bacteria Chemical synthesis , Properties & applications of polyhydroxyalkanoates blends Poly caprolactone, Poly β hydroxyl butyrate

Unit IV

Natural fibres as fillers / reinforcements in thermoplastics, fibre content, type of coupling, high fibre filled composites, Starch-Polymer composites, Thermoplastic starch, Creep and dynamic mechanical properties, water absorption, recycling and reprocessing, accelerated environment tests. Production technologies for Biopolymers, Extrusion and compounding, Injection moulding, other processing methods, additives, organic recycling compared to mechanical recycling Food packaging applications of Biobased films, specifications, safety, edible films & coatings. Environmental Impact of biopolymers: Biomedical applications of biopolymers

Text Books

1. Biodegradable Polymers for Industrial Applications : Ray Smith
2. Renewable Resources for Functional Polymers and Biomaterials : Park, Wiley Publ
3. Biopolymers : R.M. Johnson, L.Y. Mwaikambo and N. Tucker
4. Green Composites : Polymer Composites & the environment : Caroline Bathe,CRC

References:

5. Polymeric Biomaterials : Severian Dumitriu, CRC Press
6. Low Environment Impact Polymers ,Nick Tucker & mark Johnson, RAPRA Technology Ltd
7. Biopolymers : R.M. Johnson, L.Y. Mwaikambo and N. Tucker
8. Polymers as Biomaterials : Shalby .E.Shalby, Plenum Press
9. Biopolymers – New materials for Sustainable Films and Coatings. Editor. David Plunkett, Wiley