PLPE3002 BIOMEDICAL PLASTICS (3-0-0)

Course Objective:
The course aims to provide students with an in-depth understanding of biomaterials and biomedical polymers, including their biocompatibility. Students will learn to evaluate and apply biomedical polymers in various medical applications, such as implants, polymer membranes, and polymeric blood.
Syllabus

Module-I: Biomaterials & Biomedical Polymers (08 Hours)
Biomaterials: Biocompatibility, Stabilization, Inflammation and Wound Healing, Blood Clotting System, Biological response to Implants, Implant Design and Applications.
Biomedical polymers: Criteria for the selection of biomedical polymers, physico-chemical aspects of the blood compatibility of polymeric surface.

Module-II: Biomedical Polymers from Biological Sources (08 Hours)
Biomedical polymers from biological source, poly hydroxy alkanoic acids microbial polysaccharides, silk, collagen. Microbial cellulose, hyaluronic acid, synthetic polymers such as PMMA, silicon rubber, polyethylene, natural rubber, hydrogels.

Module-III: Biomedical Applications of Polymers (10 Hours)
Permanent implants for function orthopedics, cardio vascular, respiratory patches and tubes, digestive system, genitourinary system, nervous system, orbital (corneal and lens prosthesis) – permanent implant for cosmoses, other applications of engineered material in clinical practices, silicone implants. Polymer membranes, polymer skin, polymeric blood.

Module-IV: Polymeric Lenses (06 Hours)
Contact lenses, hard lenses, gas permeable lenses, flexible lenses, soft lenses, hydrogels, equilibrium swelling, and absorption and desorption, oxygen permeability, types of soft.

Module-V: Dental Polymers (08 Hours)
Dental applications, denture bases, dentate reliners, crown and bridge resins, plastic teeth, mouth protectors, maxillofacial prosthetic materials, restorative material, polyelectrolyte-based restoratives, sealants, adhesives, dental impression and duplicating materials, agar, algmater elastomers.

Course outcomes:
After the completion of this course, students will be able to:
CO1: Analyze: Justify the selection of a specific biomaterial for a specific biomedical application on the basis of specific characteristic features
CO2: Apply: Explain the suitability of polymeric biomaterials over the others on the basis of experimental evidences
CO3: Create: Criteria for the selection of biomedical polymers, physico-chemical aspects of the blood compatibility of polymeric surface
CO4: Remember: Different types of materials used in biomedical application, classify these and compare properties.
CO5: Understand: Importance and application of biomedical plastics.

Books:
1. J B Park, Bio-materials, An Introduction, Pleneum Press
2. H.F. Mark (Ed), Encyclopedia of polymer science and engineering, John Wiley and Sons New York, 1989.

3. Plastics Materials – J A Brydson.