

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

Bio-Medical Engineering

Subject Name: **Biomaterials & Implants**

Subject Code: **150301**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Internal Assessment (I)
4	0	2	6	70	30	50

Sr. No	Course content
1.	Introduction To The Use Of Non-Pharmaceutical Biomaterials: Types: Synthetics, Metals & Non Metallic Alloys, Ceramics, Inorganics & Glasses. Bioresorbable & Biologically Derived Materials, Bionatural Macromolecules, Tissue Adhesives, Bioactive Coatings, Carbon Composites. Medical Device Design Requirements, Material Selection Criteria, Preclinical Testing.
2.	Polymers: Polymerization, Polyethylene, Prosthodontic Polymers, Clinical Study Of Soft Polymers, Bioerodible Polymers, Blood Compatible Polymers, Bioactive Polymers, Hydrogels, Hard Methacrylates, Drug Incorporation Polymer Gels, Biocompatibility Of Polymers-Blood Compatibility Improvement, Compatibility Evaluation.
3.	Metals, Metallic Alloys & Ceramics: Stainless Steel, Titanium & Titanium Alloys, Cobalt Based Alloys, Nitinol, Ceramics-Introduction To Bio Medical Usages-Bonding Natural Tissue. Bio-Active Glass, High Density Alumina, Calcium Phosphate Ceramics-Porous Materials, Biological Interactions, Dental Ceramics-High Strength Materials-Thermal Expansions, Fracture Toughness. Drug Delivery from Ceramics. Wet Chemical Synthesis.
4.	Composite Bio-Materials: Soft Composites, Dental Composites, Saline, Coupling Agents, Microfield Materials, White -Light Systems Bonding To Teeth. Clinical Trials, Synthesis of Fillers, Matrix Resins, Mechanical & Physical Evaluation.
5.	Mechanical Properties: Standards & Assessments of Bio-Materials, Surface Properties of Biomaterials & Their Testing.
6.	Bio -Compatibility: Tissue Reaction to External Materials, Blood/Biomaterial Interaction. Corrosion & Wear of Bio-Materials. Treatment of Materials for Bio-Compatibility, Biodegradable Materials & Their Applications, Rheological Properties of Biological Solids-Bone Tendons, A Blood Vessels, Biological Liquids, Mucus Etc.

7.	Implant Surgical Devices, Rehabilitation Devices Used For Physiological Functions Of Human Body Systems- Improvement Or Replacement
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Reference Books:

1. Bio-Materials-An Interfacial Approach.Hence, L.I & Ethridge E. Academic Press , Newyork
2. Bio-Materials Science & Engineering. J.V. ParkPlenum Press, Newyork
3. Bio-Materials Medical Devices & Tissue Engineering -Fredrick H. Silver , Chapman & Hall , London
4. Human Bio-Materials Applications.- Wise