Course Objective:

To introduce students to the fundamental principles of biomaterials science, including the properties, classification, and applications of different types of biomaterials used in medical devices.

Course Outcome (CO):

1. To explore the interactions between biomaterials and biological systems, focusing on biocompatibility, bioactivity, and the body's response to implanted materials.
2. To provide knowledge on the design, fabrication, and testing of clinical devices using biomaterials, considering factors such as mechanical properties, degradation, and sterilization techniques.
3. To understand the regulatory and ethical considerations in the development and use of biomaterials and clinical devices, including standards, approval processes, and clinical trials.
4. To examine current trends and innovations in biomaterials and clinical devices, including the use of advanced materials, nanotechnology, and tissue engineering.

S.No.	Content	Contact Hours
1	Introduction: Definition of biomaterial, requirements of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra-vascular system). Surface properties of materials, physical properties of materials, mechanical properties.	8
2	Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking. Host tissue reaction with biometal, corrosion behavior and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants, Dental implants. Soft tissue replacement implants: Percutaneous and skin implants, Vascular implants, Heart valve implants-Tailor made composite in medium.	9
3	Polymeric implant materials: Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetals. (Classification according to thermosets, thermoplastics and elastomers). Viscoelastic behavior: creep-recovery, stress-relaxation, strain rate sensitivity. Importance of molecular structure, hydrophilic and hydrophobic surface properties, migration of additives (processing aids), aging and environmental stress cracking. Physiochemical characteristics of biopolymers. Biodegradable polymers for 8medical purposes,	8