

PMM325: INTRODUCTION TO BIOMATERIALS

L	T	P	Cr
3	1	0	3.5

Course Objective(s): Understand various classes of biomaterials and their importance in biomedical engineering. Study essential properties of biomaterials and mechanisms of their clearance in *in-vivo* applications. Study the *in-vitro* and *in-vivo* clinical applications of biomaterials in diagnostics and treatment.

Introduction: Classes of materials used in medicine, Metals, Ceramics, Synthetic polymers, Composites, Hydrogels, Bioresorbable and Biodegradable materials, Natural materials, Structure and properties relationships of biological materials.

Novel Biomaterials: Hydrogels, Self-assembling peptides, Implants materials; Metallic implant materials (stainless steels, Co-based alloys, Ti based alloys), Ceramic implant materials (aluminum oxides, hydroxyapatite glass ceramics carbons), Polymeric implant, Polymers for drug delivery.

Properties of Biomaterials: Biocompatibility, Properties of biomaterials, Physical, Thermal, Electrical and Optical, Surface properties and adhesion of bio-materials and their application to processing, Testing and clearance of biomaterials.

Applications of Biomaterials: *In-vitro* Applications, *in-vivo* applications, Biomedical application: Cardiovascular, Dental implants, Orthopedic application, Skin, Ophthalmologic applications, Wound healing, Biomedical and Biosensor applications.

Course Learning Outcomes (CLO):

Students will be able to:

1. Classify biomaterials based on their properties / applications.
2. Select appropriate biomaterial(s) for desired *in-vitro* or *in-vivo* clinical application(s).

Recommended Books:

1. B. D. Ratner, A. S. Hoffman, F. J. Schoen and J. E. Lemons, *Biomaterials Science, Second Edition: Wiley Science (2004)*.
2. L. Hench and J. Jones, *Biomaterials, Artificial Organs and Tissue Engineering (Woodhead Publishing in Materials (2002)*.
3. J. Breme, R. Thul and C. J. Kirkpatrick, *Metallic Biomaterial Interfaces Wiley (2008)*.
4. Temenoff J.S. and Mikos A.G., *Biomaterials: The intersection of Biology and Materials Science, Pearson, (2009)*.
5. Kinam Park, *Controlled Drug Delivery: Challenges and Strategies. Washington (DC): American Chemical Society (1997)*.