



# BIOMATERIALS FOR BONE TISSUE ENGINEERING APPLICATIONS

## PROF. BIKRAMJIT BASU

Department of Mechanical and Industrial Engineering  
IISc Bangalore

**TYPE OF COURSE** : Rerun | Core | UG/PG

**COURSE DURATION** : 8 weeks (29 Jul'19 - 20 Sep'19)

**EXAM DATE** : 29 Sep 2019

**INTENDED AUDIENCE** : Students of BE/ME/MSc/PhD streams

**INDUSTRIES APPLICABLE TO** : Smith & Nephew/Adler Mediequip Pvt. Ltd., Pune, CIPET, Chennai

## COURSE OUTLINE :

Biomaterials, recognized as a new class of materials in the Materials Science community, are being developed in last few decades for human health care. The design and development of biomaterials requires the integration of the concepts and expertise from two widely different disciplines, i.e. Materials Science & Engineering and Biological Science.

## ABOUT INSTRUCTOR :

Dr. Bikramjit Basu is currently a full Professor at the Materials Research Center and holds Associate Faculty position at Center for Biosystems Science and Engineering, Indian Institute of Science (IISc), Bangalore. He is currently an Adjunct faculty at Indian Institute of Technology Kanpur (IITK). After his undergraduate and postgraduate degree in Metallurgical Engineering, he earned his PhD in Ceramics at Katholieke Universiteit Leuven, Belgium in March, 2001. After a brief post-doctoral stint at University of California, Santa Barbara; he joined IITK in November 2001 as Assistant Professor and was promoted to full Professor at IITK in March, 2012. Prof. Basu's international standing and impact on the field are illustrated by his prolific publication record (more than 225 peer-reviewed journal articles, including 30 papers in journals with high impact factor (>4.0), more than 20 invited review papers/book chapters) and citation record (total citation: ~ 5,300, H-index: 41). He currently serves on editorial board of 12 SCI journals. Dr. Basu has served as a research adviser to 16 PhD students, 20 Masters students and mentored 10 young academic colleagues.

## COURSE PLAN :

**Week 01** : Introduction to Biomaterials and Biocompatibility

M1-Introduction, M2-Biomaterial, M3-Biocompatibility, M4- Host response

**Week 02** : Defining tissue engineering scaffolds and implants

M5-Tissue Eng, M6-Scaffold, M14-Bone structure, M15-Bone properties, M16-Implant-I, M17-Implant-II

**Week 03** : Structure and Properties of Proteins and Cells

M7-Proteins, M8-Cell structure, M13-Bacteria structure, M27-Antibacterial assay

**Week 04** : Stem cells and Cell fate processes

M11-Cell fate processes, M12-Cell division, M23-Cell differentiation, M24-Stem cells

**Week 05** : Cell-material Interaction (in vitro and in vivo) and Clinical trials

M18-Osseointegration, M19-in vivo testing, M9-Cell-material interaction, M10-Cell-signalling, M21-in vitro testing, M22-Cytotoxicity assays, M25-Clinical trials I, M26-Clinical trials II

**Week 06** : Manufacturing of Biomaterials (metals, ceramics and polymers)

M28-Metal manufacturing, M29-Ceramics manufacturing, M30- Polymers manufacturing, M31-Additive manufacturing

**Week 07** : HA-based composites, M32-HA-Ti-Toughness, Cell functionality, M33-HA-CaTiO<sub>3</sub> development, M34-HA-BaTiO<sub>3</sub> Functional Prop, M35-HA-Ag antimicrob & cell viability, M36-HA-ZnO, Cell fate & antimicrobial

**Week 08** : Glass ceramics for orthopedic and dental applications, acetabular socket and femoral head, prototype development; M37-Dental ceramics: processing, M38-Sr-based glass Ceramics, M39-Acetabular socket (Compression mold), M40-ZTA femoral ball head fabrication