

Fundamental of Biomaterials and Living Matter (Credits: 4; L-T-P: 3-1-0)

Basic concepts in Biomaterials Science; Chemical bonding – Concept of molecule, molecular network, macromolecule: origin of materials class; Unit cells, hierarchy, monolith, composites in materials, tissues at various length scales; Permanent and transient materials;

Concept of Stress and Strain, Fundamentals of Elastic, Plastic and Viscoelastic deformation; Defects and material design; Destructive and non-destructive testing; Elements of fracture of materials and concept of fracture toughness, self-healing; Structure and mechanical behavior of cells, tissues, organ and role of extracellular matrices; Microstructure of materials and tissues; Fracture of natural bone (cortical/cancellous), Structural and Functional properties (piezoelectric, dielectric properties) in cells and tissues turnover.

Bulk and Surface properties, surface modification, Principles of engineering manufacturing, Biosynthesis, Biomimetic design and synthesis; Customized designing and manufacturing; Molding, Advanced manufacturing and rapid prototyping;