5th Semester	RBM5C001	Biomaterials and Tissue Engineering	L-T-P 3-0-0	3 Credits

Module -I

Biomaterials: Definitions of Biomaterials & Biocompatibility, Classification of materials used in the body, performance of Biomaterials, Brief historical background of Biomaterials. Characterization of Materials: Mechanical properties: Stress-Strain Behaviour, Mechanical Failure

Module-II

Introduction, structural and organization of tissues: Epithelial, connective; vascularity and angiogenesis, basic wound healing, cell migration, current scope of development and use in therapeutic and in-vitro testing;

Module-III

Cell culture- Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell cell interaction. Aspect of cell culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors; Molecular biology aspect-Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers;

Module-IV

Scaffold and transplant- Engineering biomaterials, Degradable materials, porosity, mechanical strength, 3-D architecture and cell incorporation. Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology, stems cells; Case study and regulatory issues– cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical FDA and regulatory issues.

Module-V

Ceramic Biomaterials: Introduction, Non-absorbable materials like Alumina, Carbons & Zirconia . Biodegradable Ceramics like Calcium phosphate, Aluminum-Calcium-Phosphate (ALCAP) Ceramics, Coralline. Bioactive ceramics like Glass ceramics, Ceravital. Polymeric Biomaterials: Introduction, Polymerization & Basic structure, Polymers used as Biomaterials: Polyvinylchloride (PVC), Polyethylene (PE), Polypropylene (PP), Plolymethylmetacrylate (PMMA) and Ployesters. Composite Biomaterials: Structur

Books

1. B. Palsson, S. Bhatia, Tissue Engineering, Pearson Prentice Hall, 2003
2. G. Vunjak-Novakovic, R. Ian Freshney, Culture of Cells for Tissue Engineering, WIS, 2006
3. B. Palsson, J. A. Hubbell, R. Plonseyand J. D. Bronzino, Tissue Engineering, CRC- Taylor & Francis.
4. J. D. Bronzino, The Biomedical Engineering–Handbook, CRC; 3rd edition, 2006
5. R. P. Lanza, R. LangerandW. L. Chick, Principles of tissue engineering, Academic press199