

## **BIOMACROMOLECULES IN BIOENGINEERING (LS644A)**

(K Kar\* and V Yadav)

Sr. No.	Contents	Credit hours	Faculty
1	Introduction to biomacromolecules with specific examples	1	VY
2	Globular proteins (Hemoglobin); Fibrous protein (Collagen); Membrane proteins (Calcium Channels; Receptors); Hormones (Insulin)	2	VY
3	Regulation of enzyme activities with examples, Role of supramolecular assemblies in extracellular matrix.	3	KK
4	Protein folding, misfolding, and aggregation; amyloids, single molecule self-assembly	2	KK
5	Biodesign: Strategies to alter catalytic efficiency; Drug-protein interactions and Therapeutic designs, immobilized enzymes	3	KK
6	Applications of rationally engineered proteins and peptides: nanowires, tissue scaffolds, biomaterials,	3	KK
7	Nano-strategy in applied biological systems; Targeted Nanoformulations; Liposomes, Nanoparticles and Drug Delivery systems, multicomponent nanomaterials, Biodiagnostics, Biosensors	4	KK
8	Concepts of biomedical engineering. Types of cells, tissues, and their characteristics for Bioengineering, Stem cells and iPSCs, trans-differentiation, 3-D architecture and cell incorporation	4	VY
9	Biocompatibility, cell migration and wound healing, Basic transplant immunology, Genetic engineering of cells/tissue using nanoparticles, lentivirus and adenovirus-based delivery systems for cell/tissue lineage-specific factors, examples of specific applications: Bone and cartilage tissue engineering, cell transplantation.	6	VY

### **Books**

1. Stryer, L., Berg, J.M., Tymoczko, J.L., Biochemistry, W.H. Freeman & Co Ltd 2012
2. Cox, M.M, Nelson, D.L., Lehninger Principles of Biochemistry, W.H. Freeman & Co, 2009
3. Voet, D., Voet, J.G., Pratt, C.W., Fundamentals of Biochemistry: Life at the Molecular Level, Wiley, 2012
4. Creighton, T.E., Proteins: Structures and Molecular Properties, W H Freeman & Co; 3rd edition, 2013
5. Campbell, N.A, Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B., Biology, 8<sup>th</sup> Edition, Pearson- Benjamin Cummings, 2009.
6. Peter Atkins and Julio De Paula Physical Chemistry for the Life Sciences, 2nd Edition, Oxford University Press.
7. Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick, Lewin's GENE XII,
8. Punt; Sharon Stranford; Patricia Jones; Judy Owen Immunology, Kuby Immunology Eighth Edition| 2019
9. Principles of Tissue Engineering (2013) 4th ed., Lanza, RP, Langer, R and Vacanti, JP, Academic Press, ISBN: 978-0123983589.
10. Biomaterials (Bioengineering and Health Science (2014) 1st ed., Migonney, V, ISTE Ltd., ISBN: 978-1848215856.
11. Nanomedicine and Tissue Engineering: State of the Art and Recent Trends (2016) 1st ed., Kalarikkal, N, Augustine, R, Oluwafemi, OS, Joshy, KS and Thomas, S, Apple Academic Press. ISBN: 978-1771881180