



Course Number: BE 202

Course Name: Biochemistry and Molecular Biology

Credits: 2-0-2-3

Prerequisites: None

Intended for: B. Tech M.Tech Integrated Dual Degree Bioengineering students

Distribution: Core for Integrated Dual Degree Bioengineering students, elective for other B.Tech students

Preamble: The objective of the course is to provide students with a comprehensive and concise overview of biological science with emphases on its relationship with biomedical engineering.

Course Outline:

Theory: [28 hours]

Module1: Cell composition: [6 hours]

Chemical bonds, water, pH and buffers

Amino acids, peptides and proteins

Carbohydrates: Monosaccharides, Disaccharides, Polysaccharides and glycoconjugates

Nucleotides and Nucleic acids

Lipids: Storage lipids, structural lipids, lipid as signal, cofactors and pigments

Module 2: Bioenergetics and Biochemical Reaction [6 hours]

Bioenergetics and Thermodynamics, ATP, Biological oxidation-reduction reactions, Overview of central and secondary metabolism

Amino acid Oxidation: Metabolic fates of amino acids, Nitrogen excretion and urea cycle, amino acid degradation

Oxidative Phosphorylation: Electron transport reaction in mitochondria, ATP synthesis, Photophosphorylation, Light absorption and light driven electron flow, ATP synthesis by photophosphorylation

Module 3: Cellular energy [8 hours]

Breakdown of Sugar: Glycolysis, Gluconeogenesis and the Pentose Phosphate Pathway

The Citric acid cycle

Fatty acid metabolism: Digestion, metabolism and transport of fats, oxidation of fatty acids, ketone bodies

Module 4: Central Dogma of Life [8 hours]

Genes and Chromosomes

DNA metabolism: DNA replication, DNA repair and recombination

RNA metabolism: Transcription, RNA processing, RNA dependent RNA and DNA synthesis

Protein metabolism: The genetic code and Translation Gene Regulation

Lab: [28 hours]



1. Preparation of buffers,
2. Quantitative determination of proteins,
3. Quantitative determination of carbohydrates and lipids,
4. Isolation of nucleic acid (DNA or RNA) and its estimation,
5. Gel Electrophoresis- Protein and nucleic acid
6. DNA amplification using PCR,
7. Isolation of chloroplasts, its estimation and assay for Hill reaction

Text book:

- a. David L. Nelson, Michael M. Cox, “Lehinger Principles of Biochemistry”, 7th Edition, McMillan Learning, 2017.

Reference books:

- a. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Angelika Amon, Kelsey C. Martin, “Molecular Cell Biology” - 8th Edition W.H. Freeman, 2016.
- b. George Plopper, David Sharp, Eric Sikorski, “Lewin’s Cells” – 3rd Edition – Johns & Bartlett Publishers, 2015.
- c. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter, “Molecular Biology of the Cell” - 6th Edition; Garland Science, 2014.

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