

Approval: 8th Senate Meeting

Course Name: Cellular Fuel and Cellular Communication

Course Number: BY-503

Credit: 3-0-0-3

Prerequisites: -IC 136 - Understanding Biology or Consent of Faculty member

Students intended for: 3rd and 4th year UG and PG

Elective or Compulsory: Elective

Semester: Odd/Even

Course Preamble: Major goal of is course is to introduce the concepts of cellular biochemistry and metabolism. Other goal of this course is for student's to understand the biological functions of the biomolecules. Also students will learn the significance of signaling and its impact in relation to human health. The format of the course is a combination of lectures and student presentations. In addition to this, few journal publications will also be discussed in order to help students understand some of the recent topics in this area.

Course Outline:

Module 1 [15 Lectures]

Cellular fate of nutrients metabolism:Glucose metabolism; Glucose transporters, Glycolysis, TCA cycle, glycogen synthesis, gluconeogenesis, and glycogenolysis. Metabolism of amino acids and proteins, Metabolism of lipids;oxidation of fatty acids, ketone bodies and ketosis, de novo synthesis of fatty acids, Metabolism of nucleic acids; Biosynthesis and breakdown of purine and pyrimidine nucleotides, Salvage pathways.

Module 2[15 Lectures]

The cellular internet:The essential elements of cellular transduction mechanisms that allow signaling from the cell surface to the nucleus; reception, transduction and response. Types of signals: Endocrine, Paracrine,Neural,and Juxtacrine.Receptors and receptor trafficking, Types of Cell surface receptors: G-protein coupled receptors, Receptor tyrosine kinase receptors, Cytokine receptors and Non-tyrosine kinase receptors, Integrin receptors, Toll-like receptors, Ligand gated ion-channels receptors, Receptors with other enzymatic activities.Secondmessengers; Type of secondary molecules; diacylglycerol, phosphatidylinositols, cAMP, cGMP, IP3, and Ca²⁺.

Module 3[12 Lectures]

Hormone and Endocrine system: Body's long distance regulator; Hormones, Local regulators, Neurotransmitters, Neurohormones, and Pheromones. Type of hormones, Major endocrine gland, and Hormone transport, Hormone receptors - cell surface and intracellular, Mechanisms of hormone action, Neuroendocrine interactions.

Text Book:

1. Molecular Biology of the Cell (5th edition) by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter
2. Lehninger Principles of Biochemistry (6th edition) by David L. Nelson, Michael M. Cox
3. Endocrinology (6th Edition) by Mac Hadley (Author), Jon E. Levine (Author), Pearson Prentice Hall Publication can be proposed for the endocrinology portion.

Reference Book

1. Campbell Biology (10th Edition) by Jane B. Reece, Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Robert B. Jackson, Benjamin Cummings, 2013