
Semester-I

NS/101: CELL BIOLOGY AND NEURON ORGANIZATION
Note: Neurons contain the same intracellular components, as do other cells. Understanding of brain function would absolutely need a clear understanding of the cellular and molecular organization of neurons and glia, units. This is the paper the student is expected to learn in greater detail the subtle cellular and molecular organization of neurons and glia, the paper to be taught in about 40 lectures each of 90 minutes duration. In view of the expansion of knowledge in Cell Biology we have tried to detail out the important aspects in each topic to only outline for a level of teaching.

UNIT I
Membrane Structure and Function
Structural models: Composition and dynamics, transport of ions and macromolecules, pumps, carriers and channels. Endo- and exocytosis. Membrane carbohydrates and their significance in cell-cell recognition, cellular junctions and adhesions.

UNIT II
Organelles

UNIT III
Endo-membrane System and Cellular Motility

UNIT IV
An overview of the nervous system

UNIT V

Suggested Books:

NS/102: BIOCHEMISTRY
Note: Here we aim to let the students learn the language of biochemistry, get a balance understanding of the physical, chemical and biological properties of biomolecules, their reactions and pathways to which they operate. Get exposed to the themes related to metabolism, energy, regulation and the biochemical relationship between the structure and function. The topics to be taught in a manner that the student is able to understand the core knowledge which can challenge the future generation of neuroscientists in order to understand the biochemical aspects in relation to brain function and disorders.

UNIT I
Amino acids: structure and functional group properties. Polypeptides and collagen. Molecular structure of proteins: folding of primary and higher order structures. Structure function relationships in model proteins like ribonuclease A, myoglobin, hemoglobin, etc.

UNIT II

UNIT III

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UNIT IV
Membrane organization — sidedness and function; Membrane bound proteins — structure, properties and functions; transport phenomena: Nucleotides, nucleotides, nucleic acids — structure, diversity and functions; sequencing: Ribo overview of central dogma.

UNIT V
Bioenergetics — basic principles: Equilibrium and concept of free energy; Coupled processes: Glycolytic pathway: Kreb's cycle; Oxidative phosphorylation; Regulation of metabolic pathways; Logic and integration of central metabolism: entry/exit of various biomolecules from central pathways; principles of metabolic regulation: Regulatory steps; Signals and second messengers.

Suggested Books:

NS/103: GENETICS AND MOLECULAR BIOLOGY

Note: Current advances in molecular neurobiology and genetics have encouraged the neurobiologist to make strides in revealing more about gene expression in nervous system, elucidating nervous system development and understanding the genetic basis of diseases affecting human behavior. With the belief that there is a molecular basis for memory, behavior and mental abilities, in about 40 lectures, the basics of genetics and molecular biology will be taught to the students in this paper.

UNIT I
Introduction to genetics
Role of genetics in medicine: Mendel's laws of inheritance; linkage, crossing over and chromosomes mapping.
Mutations: Oncogenes and tumor suppressor genes

UNIT II
Genome organization

UNIT III
DNA Replication: Repair & Recombination

UNIT IV
Prokaryotic & Eukaryotic Transcription


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UNIT V
Translation & Transport

Suggested Books:
2. Stackebrandt, Genetics (3rd edition), Holtz Press, 2004
4. Livingstone, Cells and Genes (4th edition), Freeman, 2005
5. Griffiths & Miller, Introduction to Genetic Analysis (7th edition), Freeman, 2005
7. Smith, Elements of Molecular Neurobiology, Wiley, 2009

NS/104 LABORATORY TOOLS AND TECHNIQUES
Note: the prime objective of the course is to develop trained manpower that would take up the challenges of neurosciences. Research. In view of this, the students are expected to develop proficiency in the following techniques:

Unit-I
Microscopy

Unit-II
Neuropathology: Behavior
Tools in electrophysiological studies of the brain and in animals: animal activity monitoring. Different types of electrodes and their applications in studies on behavior, learning and memory and cognitive aspects of animals. Voluntary, grip strength meter: Pap sensitivity testing with the help of full-frock instrument and paw test.

Unit-III
Spectroscopy Techniques
Ultraviolet-Visible Spectroscopy, Fluorescence Microscopy, NMR, MRI

Chromatography Techniques
Chromatographic methods for macromolecule separation. TLC and paper chromatography: Gel permeation, thin layer chromatography, high performance liquid and gas chromatography, HPLC and FRC.

Electrophoretic Techniques
Theory and application of Polyacrylamide and agarose gel electrophoresis. Types of electrophorograms.

Centrifugation
Principles and types of centrifuges and their applications.

Imaging
MRI, PET, SPECT, MRS

Unit IV
Recombinant DNA Technology

Unit V
Experimental design and data analysis

Suggested Text Books

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