NS/401: CLINICAL NEUROCHEMISTRY AND NEUROPATHOLOGY

Note: Research in neuropathology/neurological disorders involves specific neurochemical changes. This paper will aim at introducing the students to the neurochemical basis of brain disorders and principles and applications of important diagnostic tools.

Unit-I
Biochemistry of peripheral Neuropathy: Diseases involving myelin. Multiple sclerosis and other demyelinated disorders; Genetic disorders of lipid, glycoprotein, and mucopolysaccharide metabolism; Duchenne Muscular dystrophy: Molecular, genetic aspects and diagnostic characteristics.

Unit-II
Nutritional and metabolic Diseases: Disorders of amino acid metabolism. Wernicke-Korsakoff Syndrome; Pellagra; Alcohol: Cerebellar Degeneration; Metabolic Encephalopathies and Coma.

Unit-III
Neurotransmitters and disorders of basal ganglia; Molecular targets of abused drugs; ischemia and hypoxia; Epilepsy: Seizures; Genetics and diagnosis of Huntington disease and other triplet repeat disorders; Alzheimer's disease: Molecular, genetic, immunological aspects and diagnostics.

Unit-IV
Theories of aging; Neurobiology of aging: Cellular and molecular aspects of neuronal aging; Aging and neurodegeneration; Parkinson's disease.

Unit-V
Motor Neuron Disease: Prion's Disease; Biochemical aspects of the psychiatric disorders; Biochemical basis of mental illness: Anxiety disorders; Mood disorders; Attention disorders; Schizophrenia.

Suggested Books:

NS/402: NANO TECHNOLOGY AND BIOINFORMATICS FOR NEUROSCIENCE

Note: This paper aims at illustrating the basic and possible applications of nanotechnology as well as bioinformatics in neuroscience. Both the aspects shall be just introduced to the students who are expected to make use of these tools in future. However, extensive details with wide range of examples shall be avoided.

NANO TECHNOLOGY

Unit-I
Introduction to nanotechnology: Molecular nanotechnology; Atoms by inference. Atomic force microscope: Nanopowders and nanomaterials; Sol-gels and their use; Use of natural nanoparticles.

Unit-II
Nanobiometrics: Lipids as nano-bricks; Proteins as nanomolecules; DNA in nanotechnology; Present and future of nanotechnology applications in: Molecular biology and Medicine.

Unit-III
Neurosciences nanotechnology: Progress, opportunities and challenges; Nanotechnology tools for probing neurons and glia; Nanoengineered materials for neuroregeneration; Nanoparticles for effective drug delivery to the CNS; Ethical issues in nanotechnology.

BIOINFORMATICS

Unit-IV
Bioinformatics: History, scope and importance; Computers, internet, WWW, and NCBI; Neuroinformatics: Concept and applications; DNA sequencing and analysis; Protein sequencing and analysis.

Unit-V
Databases, tools and their use: Sequence alignment; Predictive methods using DNA sequences; Predictive methods using protein sequences; Pharmacinformatics and drug discovery.
Suggested Text Books
3. Ignacimuthu: Basic Bioinformatics/Alpha Sciences, 2004

LABORATORY COURSE VII: NS/403: RESEARCH METHODS, BIOSTATISTICS, AND COMPUTER APPLICATIONS
1. Collection of data for statistical analysis
2. Chi square test
3. Student 't' test
4. ANOVA
5. Designing of an experiment for a hypothesis
6. Case studies at a neurology ward
7. Case studies of biological populations
8. Basics of animal handling and maintenance
9. Computer applications: Word, Excel and Power point
10. Image analysis
11. Stereology

NS/404: DISSERTATION
The students are required to take up a study in an aspect of Neuroscience. A dissertation/report has to be submitted at the time of examination. The work may be initiated at any point of time depending on the capability of a student from earlier semesters as well. This is to provide a student real exposure to planning, execution and reporting of a research proposal.

NS/405: VIVA-VOCE ON THE DISSERTATION