

Course contents for Neuroscience

1. **Faculty:** FLSB
2. **Course Code:**
3. **Course Title:** Neuroscience
4. **Number of Credits:** Two
5. **Course objectives:** The nervous system is one of the most advanced organ systems in humans. Neuroscience is a major research area in the world encompassing a diverse range of topics from diseases (both of the newborn and age-associated degenerative type to the non-pathologic psychiatric disorders and learning disabilities), techniques (from CT scan to *brainbow*), interdisciplinary areas (neural networks, AI) and ethics. In this course the basic principles of how the nervous system is formed and functions, in health and disease, at cellular and organ-level, will be studied. The course will also introduce the students to novel methods to study brain function and pharmacological and non-pharmacological interventions in various neuronal disorders.
6. **Minimum prerequisites for taking this course, if any:** Bachelor-level Chemistry or any branch of Biology, Master-level Biochemistry and Molecular Biology.
7. **Course structure with units, if applicable:** The following topics will be covered as part of the course:
 - a. Introduction to Neurosciences – history of neuroscience, ventricular doctrine, cortical localization and holistic theories of brain function
 - b. Neuroanatomy – anatomical terminology, fixation and sectioning of the brain, major brain regions and its organization, somatosensory and motor homunculus
 - c. Neuroimaging – techniques to study brain – pneumoencephalography, CT scan, principles of MRI, fMRI, DTI and PET scanning, optogenetics
 - d. Cognitive Neuroscience – phrenology, Broca’s area and the language circuit in the brain
 - e. Behavioural Neuroscience – studying behaviour in animals, brain plasticity and phantom limb concept, genes and behaviour
 - f. Comparative Neuroscience – invertebrate brain, brain morphometry and EQ, cortical evolution
 - g. Applied Neuroscience – neuroethics and its applications, psychoactive drugs, legal CNS interventions, neuromarketing, deep brain stimulation
 - h. Neuropharmacology – anaesthetics, analgesics and NSAIDs, opioids, brain vasculature and stroke, formation of CSF, blood brain barrier
 - i. Developmental Neuroscience – fertilization of the egg, midblastula transition, notogenesis, Spemann organizer zone, neural tube patterning, major brain area differentiation, graded signalling mechanisms
 - j. Neurocytology – the neuron doctrine, neuronal architecture and associated disorders, axonal transport, non-neuronal cells in the brain – formation and function
 - k. Electrophysiology – ion channels, resting membrane potential and propagated signalling, generation of an action potential, myelination, neuromuscular junction, electrical and chemical synapses, synaptic transmission
 - l. Neurochemistry – neurotransmitters and their life cycle, glutamate and long term potentiation, biology of learning and memory
8. **Suggested Readings:**
 - a. Principles of Neural Science – Eric Kandel, Schwartz and Jessell – McGraw Hill (2012)
 - b. Neuroscience – Dale Purves – Sinauer (2011: 5th ed.)
9. **Evaluation:**

Theory:	Mid-semester Written Examination	: 40% Marks
	End-semester Written Examination	: 40% Marks
	Quiz / Assignment/Presentation (oral / poster)/other	: 20% Marks