
TOPICS IN NEUROSCIENCE

(2 credits)

(SKJ)

Ph.D. (LS 642)

<u>Faculty</u>	<u>Topics</u>	<u>Approx No. of Lectures</u>
	Neuron as a cell:- Neurons, glia, and its properties, neurogenesis	1
	Stimulus, Threshold stimulation, S-D relationship, channels, Action potential, Neurotransmitter synthesis and regulation, Release of neurotransmitter, and its action.	3
	Neuroanatomy – The spinal cord, brainstem, cerebrum, cerebellum, Organization of neurons - cytoarchitecture, Functional organization, Ascending and descending tracts	3
	Reflex and its properties, monosynaptic reflex, muscle control, and posture regulation, conditioned and unconditioned reflexes	2
	Study of the brain and its functions from behavior to cellular functions from gross behavior to cellular to intracellular and molecular levels	2
	The Visual System: Visual Field, Retina, signal transduction in the retina, Receptive fields of retinal ganglion cells, organization of the visual pathways and retinotopic arrangements, the primary visual cortex and its functional hierarchy, Orientation columns, ocular dominance columns, Extrastriate Visual Areas and its functions	3
	The Auditory systems: External, middle and inner ear, Cochlea, hair cells, energy transduction in the hair cells, Electrical properties of basolateral membrane, outer hair cells as cochlear amplifier, Otoacoustic emissions, cochlear implants, the auditory nerve and its properties, tonotopic arrangements, descending and ascending systems of the hair cells, types of neurons in the auditory areas and its response to sound, binaural cues, cortical columns, and bat echolocation.	3
	Neural regulation of heart and breathing	2
	Cognition: Learning and Memory A historical perspective, types of memory, mechanisms of memory consolidation, synaptic plasticity, long term potentiation, long term depression, synaptic re-enforcement re-entry mechanisms.	2
	Sleep-Wakefulness: Mechanism and Functions A historical perspective, Sleep-Wake regulating areas, neural pathways, the role of different neurotransmitters and neuromodulators in sleep-wake regulation, functions of sleep in learning and memory and synaptic plasticity, in the regulation of the immune system, diseases associated with sleep: insomnia, sleep apnea, REM sleep behavior disorders, Narcolepsy sleep-related eating disorders etc.	3

Biorhythm:

Suprachiasmatic nucleus and biological clock, photo-ganglionic cells, retinohypothalamic tract, the discovery of the clock gene, the molecular mechanism of the circadian clock,

2

Brain: Normal, Aging and dysfunctional brain

Neurological diseases: Schizophrenia, Epilepsy, Parkinson disease, Alzheimer's disease, Down's syndrome

Total: 27 \pm 2

plus 2 quizzes, one mid term and one final exam