



GURUGRAM UNIVERSITY, GURUGRAM

(A State Govt. University established under Haryana Act 17 of 2017)

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No. GUG/Estt./2022/2695

Dated : 04.08.2022

NOTICE

Subject : Syllabus for written test for the post of Assistant Professor (on contract basis) to be engaged vide Advt. No. ET-05/2022.

Reference : This office notice endst. no. GUG/Estt/2022/2514-2516 dt. 21.07.2022 on the subject cited above.

In continuation of the above referred notice, all concerned are hereby informed the following:-

- (i) The provision of negative marking was inadvertently mentioned and thus hereby withdrawn. There will no negative marking.
- (ii) The syllabus for the written test for Neuroscience discipline is specified & attached herewith at **Annexure- 1** for clarity to all the respective applicants.

Other conditions will remain same. All concerned are hereby advised to take note of above.

Sd/-

REGISTRAR

Copy to;-

1. The Deputy Registrar (I.T) for uploading on University website.
2. The Deputy Registrar (Estt)
3. PA to VC/Registrar (for information)

ANNEXURE- '1'

Syllabus for Assistant Professor (on contract basis) in Neurosciences

CELL BIOLOGY AND NEURON ORGANIZATION

1. Membrane Structure and Function, structural models; Composition and dynamics
2. Transport of ions and macromolecules; Pumps, carriers and channels
3. Endo- and exocytosis; Membrane carbohydrates and their significance in cellular recognition; Cellular junctions and adhesions
4. Nucleus – Structure and function of nuclear envelope, lamina and nucleolus; Macromolecular trafficking; Chromatin organization and packaging
5. Cell cycle and control mechanisms
6. Mitochondria – Structure; Organization of respiratory chain complexes; ATP synthase; Structure-function relationship; Mitochondrial DNA and male sterility
7. Structure and function of Golgi apparatus, lysosomes and endoplasmic reticulum
8. Organization and role of microtubules and microfilaments; Cell shape and motility
9. Actin-binding proteins and their significance; Muscle organization and function; Molecular motors; Intermediate filaments; Extracellular matrix in animals
10. An overview of the nervous system
11. Neurons: Introduction to neurons, The Neuron Doctrine, and other principles of neural organization, Nissl and Golgi stains,
12. Components and cytology of neurons, Classification and types of neurons
13. Dendrite structure and function, Axon structure and functional aspects, myelination and synapses
14. Glial cells: Structure and function of glial cells, Different types of glial cells: astrocytes, oligodendrocytes and Schwann cells
15. Astrocytes – type I & II astrocytes, fibrous and protoplasmic astrocytes, Importance of astrocytes in glutamate metabolism and blood brain barrier
16. Role of oligodendrocytes and Schwann cells in myelination
17. Functions of Microglial cells; Microglial phenotypes in injured and disease brain
18. Overview of glial and neuronal relationship and interplay in the CNS

Suggested Books:

1. Siegel, Basic Neurochemistry (8th Edition) Academic Press, 2015
2. Alberts, Molecular Biology of the Cell (6th Edition) Garland Science, 2015
3. Kandel, Principles of Neural Science (5th edition, 2013; 6th edition 2021), McGraw Hill
4. Verkhratsky, Glial Neurobiology, A Text Book, Wiley, 2007

NEUROANATOMY

1. Gross anatomy of the adult brain; organization of the nervous system
2. Subdivisions of the nervous system; Concept of CNS, PNS & ANS
3. The scalp, skull and meninges
4. Cerebrospinal fluid
5. Constitution of CNS: Overview; Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of axons
6. Peripheral nervous system: General organization; nerves, roots and ganglia; sensory endings
7. Spinal cord: Gross anatomy, internal structure, tracts of the ascending and descending fibers, spinal reflexes
8. Brainstem: Medulla oblongata, pons, fourth ventricle, Midbrain, nuclei and tracts, reticular formation
9. Cranial nerves: Functional aspects, classification of cranial and spinal nerve components
10. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Thalamus; Scheme of thalamic organization, nuclei of the thalamus
11. Functional aspects and classification of cranial and spinal nerve components
12. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Basal ganglia: Corpus striatum, subthalamic nucleus, substantia nigra
13. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Cerebellum: Gross anatomy, cerebellar cortex, central nuclei, cerebellar peduncles, functional anatomy of cerebellum
14. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Cerebral cortex: Histology, general organization, functional localization
15. Ascending sensory pathways; Descending motor pathways
16. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Auditory system
17. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of Visual system
18. Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of olfactory system and Limbic system

Suggested Books:

1. John A. Kiernan, Barr's the Human Nervous System (10th Edition), Lippincott-Raven, 2014
2. Richard S. Snell, Clinical Neuroanatomy for the Medical Students (7th Edition) Lippincott-Williams & Wilkins, 2010

3. Susan Standring (Editor-in-Chief), Gray's Anatomy: The Anatomical Basis of Clinical Practice (42nd Edition), Elsevier, 2005
4. M.J.T. Fitzgerald, Clinical Neuroanatomy & Related Neuroscience (5th Edition) CRC Press, 2007
5. Water, J. Hendelman, Atlas of Functional Neuroanatomy, CRC Press, 2000

GENETICS AND MOLECULAR BIOLOGY

1. Introduction to genetics; Role of genetics in medicine; Mendel's laws of inheritance; Linkage, crossing over and chromosome mapping
2. Mutations; Oncogenes and Tumor suppressor genes: Nonsense, missense and point mutations; Intragenic and Intergenic suppression; Frame shift mutations; Physical, chemical and biological mutagens
3. Transposition - Transposable genetic elements in prokaryotes and eukaryotes; Mechanisms of transposition; Role of transposons in mutation
4. Viral and cellular oncogenes; Tumor suppressor genes from humans; Structure, function and mechanism of action of pRB and p53 tumor suppressor proteins
5. Activation of oncogenes and dominant negative effect; Suppression of tumor suppressor genes; Oncogenes as transcriptional activators
6. Organization of bacterial genome; DNA as genetic material; Structure of DNA; Structure of eukaryotic chromosomes
7. Role of nuclear matrix in chromosome organization and function; Matrix binding proteins; Heterochromatin and Euchromatin
8. DNA re-association kinetics (Cot curve analysis); Repetitive and unique sequences; Kinetics and sequence complexities; Satellite DNA; DNA melting and buoyant density; Packing and organization of chromatin; Nucleosome phasing; DNase I hypersensitive regions; DNA methylation & Imprinting
9. DNA Replication; Repair & Recombination: Concepts of replication initiation, elongation and termination in prokaryotes and eukaryotes; Enzymes and accessory proteins involved in DNA replication; Fidelity in replication; Replication of single stranded circular DNA
10. Gene stability and DNA repair; DNA repair enzymes; Photoreactivation; Nucleotide excision repair; Mismatch correction; SOS repair
11. Recombination: Homologous and non-homologous recombination; Site specific recombination; Holliday structure; Resolution; Chi sequences in prokaryotes; Gene targeting; Gene disruption; FLP/FRT and Cre/Lox recombination RecA and other recombinases
12. Prokaryotic Transcription & Regulation; Promoters; Regulatory elements; Transcription unit; Constitutive and Inducible promoter; Operators; Initiation; Attenuation; Termination; Rho-dependent and independent termination; Anti-termination; Transcriptional regulation; Positive and negative regulation
13. Operon concept; Regulation of transcription of lac, trp, ara, his, and gal operons; Transcriptional control in lambda phage; Transcript processing; Processing of tRNA and rRNA
14. Eukaryotic transcription and regulation; RNA polymerase structure and assembly; RNA polymerase I, II, III; Eukaryotic promoters and enhancers; General Transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); Activators and repressors
15. Transcription initiation, elongation and termination; Activation and repression; Transcriptional and post-transcriptional gene silencing; Expression and processing of heterogeneous nuclear RNA, tRNA, rRNA; 5'-Cap formation; 3'-

- end processing and polyadenylation; Splicing; RNA editing; Nuclear export of mRNA; mRNA stability; Catalytic RNA
16. Translation & Transport: Translation machinery; Mechanism of initiation, elongation and termination, Ribosome; Composition and assembly of Protein synthesis
 17. Co- and post-translational modifications; Transport of proteins and molecular chaperones; Protein stability; Protein turnover and degradation
 18. Universal genetic code; Degeneracy of codons; Termination codons; Isoaccepting tRNA; Wobble hypothesis; Genetic code in mitochondria

Suggested Books:

1. Simmons, Principles of Genetics (7th Edition), Wiley, 2011
2. Strickberger, Genetics (3rd Edition), PHP Press, 2008
3. Alberts, Molecular Biology of the Cell (6th Edition) Garland Science, 2015
4. Lewin, Genes X, Jones & Bartlett, 2013
5. Griffiths & Miller, Introduction to Genetic Analysis (8th Edition), Freeman, 2005
6. Lodish, Molecular Cell Biology (6th Edition), Freeman, 2008
7. Smith, Elements of Molecular Neurobiology, Wiley, 2002

BIOCHEMISTRY

1. Chemical basis of life; Composition of living matter; Water – properties, pH, ionization and hydrophobicity; Biomolecular hierarchy
2. Macromolecules; Molecular assemblies; Structure-function relationships
3. Amino acids – structure and functional group properties; Peptides and covalent structure of proteins
4. Proteins- elucidation of primary and higher order structure; Evolution of protein structure
5. Structure-function relationships in model proteins like ribonuclease A, myoglobin, hemoglobin, chymotrypsin etc.
6. Enzyme catalysis – general principles of catalysis; Quantitation of enzyme activity and efficiency
7. Enzyme characterization and Michaelis-Menten kinetics; Relevance of enzymes in metabolic regulation, activation, inhibition and covalent modification; single substrate enzymes
8. Sugars - mono, di, and polysaccharides; suitability in the context of their different functions- cellular structure, energy storage, signaling
9. Glycosylation of other biomolecules - glycoproteins and glycolipids
10. Lipids - structure and properties of important members of storage and membrane lipids; lipoproteins
11. Biomembrane organization - sidedness and function
12. Membrane bound proteins - structure, properties and function; transport phenomena
13. Nucleosides, nucleotides, nucleic acids - structure, diversity and function; sequencing, Brief overview of central dogma
14. Bioenergetics-basic principles; Equilibria and concept of free energy; Coupled processes
15. Glycolytic pathway; Krebs's cycle; Oxidative phosphorylation

16. Elucidation of metabolic pathways; Logic and integration of central metabolism
17. Entry/ exit of various biomolecules from central pathways
18. Principles of metabolic regulation; Regulatory steps; Signals and second messengers

Suggested Books:

1. Nelson & Cox, Principles of Biochemistry (5th Edition), Freeman, 2008
2. Voet&Voet, Biochemistry (4th edition), Wiley Press, 2006
3. Stryer, Biochemistry (6th Edition), W.H. Freeman, 2007
4. P.S. Bisen, Laboratory Protocols in Applied Life Sciences, CRC 2014
5. P.S. Bisen& Anjana Sharma, Introduction to Instrumentation in Life Sciences, CRC 2013

NEUROCHEMISTRY

1. Synaptic transmission and cellular signaling: An overview
2. Acetylcholine: Chemistry, synthesis, storage and release; Nicotinic and muscarinic receptors
3. Catecholamine: Biosynthesis, storage and release; Dopamine, adrenergic receptors
4. Serotonin: Synthesis, action and distribution; Role of serotonin receptors in behavior
5. Excitatory amino acid transmitters: Synthesis, metabolism, distribution and receptor subtypes
6. Histamine: Dynamics, molecular sites and action in the CNS
7. GABA, glycine: Synthesis, uptake and release; Receptors of GABA and glycine
8. Neuropeptide neurotransmitters: Biosynthesis, function regulation and receptors
9. Opioid peptide and opioid receptors: Synthesis, metabolism, distribution and receptor subtypes
10. CSF; Microcirculation and blood brain and CSF barriers
11. Intracellular signaling; G Proteins and second messengers
12. Metabolism: Energy metabolism of the brain; Hypoxic-Ischemic brain injury and oxidative stress
13. Metabolic encephalopathies
14. Eicosanoids, docosanoids, platelet-activating factor and inflammation
15. Mechanism of action of drugs
16. Drug addiction, drug abuse and adverse drug reaction
17. Neuroendocrinology of behaviour
18. Apoptosis and necrosis

Text Books

1. Siegel, Basic Neurochemistry (8th Edition) Academic Press, 2015
2. Friefelder: Practical Biochemistry
3. Kandel, Principles of Neural Science (5th edition), McGraw Hill, 2013
4. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013

DEVELOPMENTAL NEUROBIOLOGY

Unit-I

1. Early embryology of metazoans: cleavage, formation of blastula and gastrula
2. Derivation of neural tissue and early neural morphogenesis in vertebrates and invertebrates
3. Neural Induction: Interactions with neighboring tissues in making neural tissue, organizer concept, Molecular nature of the Neural inducer, Conservation of neural induction, Interactions among the ectodermal cells in controlling neuroblast segregation
4. Patterning, polarity and segmentation of the nervous system: Regional identity of the nervous system, The anterior-posterior axis and Hox genes
5. Signaling molecules that pattern the anterior-posterior axis in vertebrates: heads or tails
6. Organizing centers in the developing brain, Forebrain development, prosomeres and Pax genes
7. Dorsal-ventral polarity in the neural tube, Patterning of the cerebral cortex, Dorsal Neural tube and neural crest
8. Genesis and migration of neurons; cellular and molecular mechanisms describing the generation of appropriate number of neurons and glia from neuronal precursors
9. Generation of neurons and glia and control of neuronal and glial cell population
10. Histogenesis of cerebral cortex and cerebellar cortex, Molecular mechanisms of neuronal migration in PNS and CNS
11. Neurogenesis in post-embryonic and adult age
12. Neuronal determination and differentiation: Transcriptional hierarchies in invariant lineages in *C. elegans*; Spatial and temporal coordinates of determination and *Drosophila* CNS neuroblast segregation
13. Asymmetric cell division and asymmetric fate, Specification and differentiation of vertebrate neural crests
14. Naturally occurring Neuronal death during development: target dependent and innervation dependent neuronal death, Intracellular-signaling pathways that mediate death
15. Neurotrophic factors: Neurotrophins and their receptors, Intracellular-signaling pathways that mediate cell survival
16. Axon growth, path finding and nerve patterns: Growth Cone, Dynamic cytoskeleton, axonal navigation and axon elongation, Directional information to growth cones: cell adhesion molecules, repulsive guidance, chemotaxis gradients and other guidance molecules; Target recognition and Target selection
17. Synapse formation and elimination: Initiation of synaptic contacts, structure and function of newly formed synapses, Presynaptic and postsynaptic elements, synapse elimination
18. Experience and Refinement of synaptic connections, Rearrangement of developing neuronal connections: Synaptic rearrangement in different parts of the nervous system
19. Denervation and regeneration of synaptic connections; Effects of Denervation on the postsynaptic cell; Denervation super-sensitivity, susceptibility to innervation, and axonal sprouting

20. Repairing the damaged brain; Regeneration of central and peripheral axons in mammalian nervous system

Suggested Books:

1. Sanes, Development of the Nervous System (4th Edition), Academic Press, 2019
2. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
3. Kandel, Principles of Neural Science (5th edition), McGraw Hill, 2013
4. Gilbert, Developmental Biology (11th edition) Sinauer Publication, 2016

CELLULAR NEUROPHYSIOLOGY AND BIOPHYSICS

1. Electrical properties of excitable membranes: Basic electricity and electric circuits
2. Neurons as conductors of electricity, equivalent circuit representation
3. Electrical properties of excitable membranes: Membrane conductance, linear and nonlinear membrane, ionic conductance, current-voltage relations
4. Ion movement in excitable cells: Physical laws, Nernst-Planck Equation, active transport of ions, movement of ions across biological membranes
5. Membrane potential and role of sodium and potassium pumps
6. *Neural Signals*: Overview of Neurons, Synapses and Networks
7. Stimulus → Sensory Perception → Motor Action / Higher Brain Function
8. Chemical and Electrical Signaling Within a Circuit; Methods to Record Electrical Activity of a Neuron
9. Action potential, non-gated ion channels and generation of action potential
10. Electrical properties of neurons, quantitative models of simulations, Hodgkin & Huxley's analysis of squid giant axon: Voltage-clamp experiments
11. Voltage gated channels; Biophysical, biochemical and molecular properties of voltage gated channels
12. Synaptic vesicles, Principles of synaptic transmission: Electrical and chemical synapses
13. Calcium hypothesis: Role of calcium in control of transmitter release
14. Synthesis and trafficking of neuronal proteins
15. Synaptic transmission at nerve-muscle synapses
16. Synaptic transmission at central synapses
17. Ligand gated channels
18. Second messengers and synaptic transmission

Suggested books:

1. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
2. Kandel, Principles of Neural Science (5th edition 2013, 6th edition 2021), McGraw Hill
3. Duchene E. Haines, Fundamental Neuroscience for Basic & Clinical Applications (4th Edition), Churchill Livingstone, 2012
4. Bear, Neuroscience-Exploring the Brain (4th Edition), Lippincott, 2016

IMMUNOLOGY

1. Immunology- fundamental concepts
2. Innate and acquired immunity, components of innate and acquired immunity
3. Antibody structure, antigen-antibody interactions
4. Cells and organs of the immune system and regulation of immune response
5. Cellular basis of adaptive immunity, B-cell and antibodies
6. Generation of antibody diversity
7. T cells; Helper T cells and lymphocytic activation
8. MHC I and II proteins
9. Immunity to infections: Bacterial, viral, fungal and parasitic infections (with examples from each group)
10. Multiple sclerosis and autoimmune disease
11. Mechanisms of neuroinflammation; Role of astrocytes, Schwann cells and microglia
12. Hypersensitivity: mechanisms and consequences of different types of hypersensitivity reactions
13. Tolerance and Autoimmunity; mechanisms of induction of autoimmunity
14. Transplantation
15. Tumor immunology and Immunodeficiency
16. Neuro-AIDS
17. Immuno-technology: Hybridoma technology, Monoclonal antibodies, Vaccines, DNA vaccines
18. Immunochemical techniques: antigen-antibody interactions and other cellular techniques

Suggested Books:

1. Kuby Immunology (7th Edition), W.H. Freeman, 2013
2. Banjamini, Immunology (5th edition), Wiley Liss, 2003
3. M. Roitt, Immunology (7th Edition), Mosby Publication, 2006
4. Janeway, Immunobiology (6th Edition), Churchill Livingstone, 2008
5. Verkhratsky, Glial Neurobiology, A Text Book, Wiley, 2007

SENSORY AND MOTOR SYSTEMS

1. Sensation and perception, Organizational principles and coding mechanisms of sensory systems, Sensory Receptors, Parallel processing, Central processing, Common anatomical plan
2. Structure, function & connections of sensory cortex
3. Somatosensory System: Peripheral mechanisms of somatic sensation
4. Spinal and Brainstem components of somatosensory system; Thalamic ventrobasal complex,
5. Sensory Transduction: Phototransduction, olfactory transduction, taste, mechanoreception
6. Touch: Active and passive touch, Properties and functional features of mechanoreceptors
7. Primary somatosensory cortex and information processing on touch, representation of body surfaces in the brain, cortical responses to stimuli
8. Pain: Nociceptors, Flow of nociceptive signals from nociceptors to neurons in the spinal cord, peripheral and central hyperalgesia, nociceptive pathways to thalamus, control of pain, opioid peptides and endogenous pain control
9. Taste: Taste receptors and taste buds, turnover & replacement, Innervation by cranial nerves, Flow of gustatory afferent information, Extraction of sensory information, Turning of peripheral taste fibers
10. Olfaction: Odor stimuli, Olfactory receptor cells, Molecular receptive Ranges of olfactory cells, Convergence of olfactory projections, Information processing and the role of dendro-dendritic synapses in the olfactory bulb, Olfactory cortex, Vomeronasal system and pheromones detection in Accessory Olfactory Bulb
11. Vision: Fundamental concepts in visual physiology, eye and retina, retinal ganglion cells, basic retinal circuit, Lateral geniculate nucleus, visual perception and geniculostriate pathway, Visual cortex
12. Audition: Amplitude and frequency ranges of hearing, External & middle ear, The Cochlea, The auditory nerve, Descending systems to the periphery, Central Nervous System
13. Fundamentals of Motor Systems: Spinal cord as central pattern generator; Reflexes and locomotion, Brain projections to spinal cord; Posture and voluntary movement, Basal nuclei and cerebellum; Focusing and coordinating movement
14. Muscle, Motor neurons and Motor neuron pools: Skeletal muscle, Motor Units, Motor neuron pools, Muscle afferents
15. Spinal Motor control, Reflexes and locomotion: Basic Principles, Reflexes, Interneurons associated with movements, Locomotion
16. Supraspinal Descending Control: The medial "Postural" System: Ablation and transection studies; Sensory information about head posture, Postural reflexes of the head and the body, Role of Brainstem in controlling coordinated postural reactions, vestibular damage & disorders of the postural control
17. Voluntary Descending Control: Cortical pathways to Motor Neurons, Organization of the Motor cortex, Control of voluntary movements by the motor cortex
18. Eye Movements: Gaze-stabilization mechanisms, Gaze-shifting Mechanisms, the Oculomotor Nuclei and the extra ocular muscles, The Vestibulo-Ocular

- Reflex, The optokinetic System, The Saccadic System, Smooth pursuit, Vergence movements
19. Basal Ganglia: Anatomy of the Basal Ganglia, Signaling in Basal Ganglia, Effect of damage in behaviour, Fundamental Principles of Basal Ganglia operation
 20. Cerebellum: Anatomy and Phylogenetic Development of the cerebellum, Assessing Cerebellar Function

Suggested Text Books

1. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
2. Kandel, Principles of Neural Science (5th Edition, 2013; 6th edition 2021), McGraw Hill
3. Allan Siegel & H. N. Sapru, Essential Neuroscience (3rd Edition, 2015)

REGULATORY SYSTEM

1. Chemical Control of Brain and Behaviour: Organizational Principles of Adult Hypothalamus
Role of hypothalamus and pituitary hormones
2. The ANS in regulation of brain and behaviour
3. ANS Pharmacology- Transmitter and Receptor Coding
4. Autonomic Controls of Homeostasis, Hierarchically Organized CNS Circuits
5. The diffuse modulatory systems of the brain: Locus coeruleus, raphe nucleus, substantia nigra, etc.
6. Neural Control of the Breathing: Breathing & gas exchange, CNS & Breathing, Respiratory Rhythm Generation
7. Sensory Inputs and Altered Breathing, Modulation of Respiratory Motor output
8. Suprapontine structures and Breathing, Respiratory neurons and their discharge pattern
9. Cardiovascular System: Basics of Cardiovascular physiology, Sympathetic Vasomotor Tone
10. Neural Control of Heart, Cardiovascular Homeostasis, The Nervous System and the Long-term control of the Cardiovascular System
11. Anatomy and Physiology of the Brainstem regulatory Systems
12. Circadian Timing: Pineal and Circadian Rhythms, The Suprachiasmatic Nucleus, Light as the Dominant Stimulus
13. Circadian timings and reproduction, Heritability of Circadian Timings
14. Sex and behaviour: Neuronal basis of sexual behaviour, Sex Hormones and Brain, The Accessory Olfactory Pathway
15. Sleep and Dreaming: The two states of sleep- slow wave and rapid eye movement
16. Maternal Stimulation and Male Psychosexual Development. Why and how male and female brains differ?
17. Motivation & Reward: Neural Mechanisms of Motivation, Dopamine and Lateral Hypothalamic Syndrome, Reinforcement System
18. Brain Aversion Systems
19. Plasticity of nervous system
20. Addiction

Suggested Text Books

1. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
2. Kandel, Principles of Neural Science (5th Edition, 2013; 6th edition 2021), McGraw Hill
3. Allan Siegel & H. N. Saprú, Essential Neuroscience (3rd Edition, 2015)

BEHAVIOUR AND COGNITIVE NEUROSCIENCE

1. A brief history of cognitive neuroscience
2. Organization of central nervous system in relation to cognition
3. Evolutionary and comparative principles, mammalian evolution
4. Human Brain Evolution
5. Brain and cognitive development
6. Aging and cognition
7. Pathological processes in cognitive development and aging
8. Cognitive functions of the motor system
9. Visual perception of objects: Neuronal basis of object recognition, Perception and recognition of specific classes of objects
10. Spatial cognition: Neural system of spatial cognition- Parietal cortex, Frontal cortex, Hippocampus and adjacent cortex
11. Theories of learning and memory: Models and mechanisms of short-term and long-term memory
12. Learning and Memory: Basic Systems: Basic mechanisms of learning, key insights from invertebrate studies, Classical conditioning in vertebrates
13. Long-term potentiation and long-term depression
14. Learning and memory: Brain systems, Major memory systems in mammalian brain, Multiple memory systems and behavior
15. Attention: Varieties of attention and Neglect syndrome, Visual system and attention
16. Language and communication: Animal communication, Human language, Neuronal organization for language
17. Executive brain functions: Role of prefrontal cortex, Neurophysiology of prefrontal cortex, Theories of prefrontal cortex function
18. Consciousness

Suggested Text Books

1. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
2. Kandel, Principles of Neural Science (5th Edition, 2013; 6th edition 2021), McGraw Hill
2. Banich, Cognitive neuroscience (3rd Edition) Wordsworth, 2011
3. Gazzaniga, Cognitive Neuroscience (4th Edition) Norton, 2014

CLINICAL NEUROCHEMISTRY AND NEUROPATHOLOGY :-

1. Neurochemical and molecular mechanisms of peripheral Neuropathy; Diseases involving myelin
2. Multiple sclerosis and other demyelinated disorders
3. Genetic disorders of Lipid, glycoprotein, and Mucopolysaccharide metabolism
4. Molecular and genetic aspects and diagnostic characteristics of Duchenne Muscular dystrophy
5. Nutritional and metabolic Diseases: Disorders of amino acid metabolism
6. Wernicke-Korsakoff syndrome; Pellagra; Alcoholic Cerebellar Degeneration
7. Metabolic Encephalopathies and Coma
8. Neurotransmitters and disorders of basal ganglia; Molecular targets of abused drugs
9. Ischemia and hypoxia
10. Epileptic seizures
11. Genetics and diagnosis of Huntington disease and other triplet repeat disorders
12. Alzheimer's disease: Molecular, genetic, immunological aspects and diagnostics
13. Theories of aging; Neurobiology of aging: cellular and molecular aspects of neuronal aging
14. Aging and neurodegeneration
15. Parkinson's disease
16. Motor Neuron Diseases
17. Prion's Disease
18. Biochemical aspects of the psychotic disorders
19. Biochemical basis of mental illness: anxiety disorders; Mood disorders
20. Attention disorders; Schizophrenia

Suggested Books:

1. Brady, Basic Neurochemistry (8th Edition) Academic Press, 2012
2. Squire, Fundamental Neuroscience (4th Edition), Elsevier, 2013
3. Kandel, Principles of Neural Science (5th Edition, 2013; 6th edition 2021), McGraw Hill
4. Duchene E. Haines, Fundamental Neuroscience for Basic & Clinical Applications (3rd Edition), Churchill Livingstone, 2006
5. Bear, Neuroscience-Exploring the Brain (3rd Edition), Lippincott, 2007