

Course Code	Course Name	L-T-P	Credits
PSY1112	Biopsychology	5-1-0	6

Module 1: Introduction to discipline of Biopsychology (15 lecture hours + 4 tutorial hours)

Definition, nature, and scope of biopsychology, Divisions of biopsychology. Theoretical foundations of biopsychology (Darwin's theory of evolution, Mendelian genetics, epigenetic theory of brain development, neuroanatomy, and neurophysiology). Methods of research in biopsychology (visualizing and stimulating living human brain, recording human psychophysiological activity, invasive methods, pharmacological methods, behavioural assessments, cognitive neuroscience methods, animal behaviour studies)

Suggested Activities:

Review of biopsychological researches to learn about the study design and methods employed.

Group interaction/webinar with a bio psychologist, Participant presentations and discussions on theoretical foundations of biopsychology, Discussions on curious case studies in biopsychology, Debate on ethical aspects of biopsychological research.

Module 2: Neuroanatomy and neurophysiology (15 lecture hours)

Nervous system and its functions, cells of the nervous system, structure and electrical activity of neurons, communication between neurons. Organization of the nervous system: central and peripheral nervous system and their divisions. Brain anatomy and physiology: major anatomical subdivisions of human brain and their functions, cerebral cortex (hemispheres and lobes), structure and functions of spinal cord, autonomic nervous system, and its functions.

Suggested Activities:

In class drawing exercises of brain anatomy, Class quiz - Labelling the anatomical parts of the nervous system, Creative hand/computer aided modelling of brain anatomy, Illustrative presentations by participants on neuroanatomy, Group interaction with expert in neurophysiology, Visit to anatomy units/brain museums, Visit to a neurology unit of a hospital.

Module 3: Physiology of sensation and perception (15 lecture hours + 3 tutorial hours)

Senses and types, receptors, sensory systems and neuronal pathways, transduction and stimulus processing in the brain, Vision: Anatomy of the visual system, neural mechanisms of visual perception. Audition: Anatomy of the auditory system, neural mechanisms of auditory perception. Gustation: Anatomy of taste buds and gustatory cells, neural mechanisms of perception of gustatory stimulus. Olfaction: Anatomy of olfactory apparatus, neural mechanisms of perception of olfactory stimulus. Somatic senses: The body senses (touch, pressure, temperature, and pain), perception of body senses. Neural mechanism of perception of kinaesthetic and vestibular sensations

Suggested Activities:

In class drawing exercises of human sensory systems and receptor pathways, Class quiz - Labelling the anatomical parts of the sensory systems of human body, Creative hand/computer aided modelling of sensory system, Illustrative presentations by participants explaining sensory systems and neural pathways, Group interaction with expert in sensory biology, Visit to anatomy units/brain museums, Visit to ENT and physiotherapy clinics.

Module 4: Neuronal regulation of sleep and internal environment (15 lecture hours + 4 tutorial hours)

Sleep and biological rhythms: functions of sleep, physiological mechanisms of sleep and waking, stages of sleep. Ingestive behaviours: hunger and thirst drives and its functions, neurophysiological mechanisms regulating ingestion, eating patterns and nutrition adherence.

Reproductive behaviour: sexual drive and its functions, neuroendocrinological regulation of sexual and parenting behaviours.

Suggested Activities:

In class neural circuit drawing exercises, Class quiz, Participant presentations on disorders of sleep and biological rhythms, visit to sleep disorder clinic.

Module 5: Neurobiology of learning, memory, and emotion (15 lecture hours + 4 tutorial hours)

Learning and memory: Neurobiological mechanism of learning and representation of learned information. Emotions: brain mechanisms of human emotional experience, neural mechanisms of fear conditioning, neuroendocrinological regulation of stress response.

Module 6: Additional readings (topics for self-study)

Historical background and development of the discipline of biopsychology, Brain development and change across lifespan, Modular organization of brain and localisation of brain functions

Hemispheric lateralization: Left and right hemispheres and their functional differences, split brain studies, Neocortical layers and their functions, Blood supply to CNS, Protective layers of brain, Cranial nerves and their respective functions, Cerebrospinal fluid system (CSF system), Structure and functions of peripheral nerves, Sensory processing disorders, Sleep disorders, Neural mechanisms of movement, Neural mechanisms of forgetting, Psychoneuroimmunology: Immunity, mood states and disease/well-being, Psychoneuroendocrinology: HPA axis and regulation of behaviour, Recent advances in biopsychology

Suggested Activities:

In class neural circuit drawing exercises, Class quiz, Illustrative presentations by participants on brain mechanisms of learning, memory, and emotions, visit to clinical/rehabilitation facility providing treatment services to individuals with neurological disorders. Group interaction with a neuropsychologist

Readings

- Carlson, N. R. (2008). *Foundations of physiological psychology*. Boston: Pearson/A and B.
- Toates, F. M. (2011). *Biological psychology*. Harlow: Pearson Education.
- Leukel, F. (1978). *Essentials of physiological psychology*. Saint Louis: Mosby.
- Pinel, J. P. J., & Barnes, S. J. (2018). *Biopsychology*. Harlow: Pearson Education Limited.
- Vaz, M. D., Raj, T. D., & Anura, K. D. (2016). *Guyton & Hall Textbook of Medical Physiology: a South Asian Edition*. Elsevier India.