**Course Title:** **Behavioural Neuroscience**

**Programme in which it is offered: M.Sc. in Applied Psychology**

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| **Course Category: Core Schedule of Offering: Semester 1**  **Course Credit Structure : 4 Course Code : PSY6115**  **Total Number of Hours: 60 Contact hours per week: 4**  **Lecture: 3 Tutorial: 1 Practical: 0**  **Last Revision Year: 2022** |

**Course Introduction**

The Behavioural Neuroscience course provides advanced training and education in issues related to human behaviour and its relationship to the brain. The relationship between structure and function at various levels of neural integration is covered in this course. Topics include the structure and function of the nervous system, physiological approaches to understanding behaviour, hormones and behaviour, biological bases of sensation and perception and learning and memory, The Behavioural Neuroscience course is meant to provide you with a solid foundation in psychology's biological and psychological foundations and the practical skills of a professional neuroscientist, such as data analysis and interpretation, lab research, and critical research thinking.

**Course Objectives**

* To introduce participants to the field of behavioural neuroscience which has contributed to the understanding of biological mechanisms of human psychological processes
* To help participants develop basic knowledge of structure and function of the human nervous system and and the development of the nervous system
* To help participants develop basic understanding the influence of drugs on human behaviour
* To help participants develop a basic understanding of the neurobiological mechanisms of creation and regulation of internal drives and biological rhythms.
* To help participants understand the physiological mechanisms of learning and memory and emotional behaviours.

**Course outcomes**

* Identify and describe the basic functions of gross anatomical structures of the human brain.
* Recognize the influence of diverse genetic and pharmacological factors on brain function and behaviour.
* Evaluate different strategies for studying the brain-behaviour connection critically
* Recognize the human sensory and motor systems' key neurobiological characteristics.
* Develop an understanding of the neurobiological mechanisms governing basic psychological processes and experiences

**PO-CO Mapping**

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| CO/PO Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1 | ✓ |  |  |  |  |  | ✓ |  | ✓ |
| CO2 | ✓ |  |  |  |  |  |  |  | ✓ |
| CO3 | ✓ | ✓ |  |  |  |  |  |  | ✓ |
| CO4 | ✓ |  |  |  |  |  |  |  | ✓ |

**Prerequisites and other constraints**

Admission to the MSc Programme in psychology stream.

**Teaching Pedagogy**

The coursework will be activity-based involving assignments, lectures, visual illustrations, drawing exercises, case studies, class quizzes, lab exercises, presentations, group discussions, debates, webinars with bio psychologists and field visits to human anatomy units and brain labs/museums. Didactic lectures facilitated through informative slide presentations, 3D video illustrations and neuroscience animations will be utilized to help participants understand the basic concepts of neurophysiology. Documentaries, lab visits and expert interactions will be utilized to enhance the learning process. Anatomical drawing exercises and presentations will be helpful in developing visual and spatial brain maps of learned information. Discussions/debates will be organized on core themes to enhance the critical thinking skills

**Modules**

**Module 1: Introduction to Behavioural Neuroscience (8 hrs)**

* Nature and scope of behavioural neuroscience
* The historical development of behaviour neuroscience as a scientific discipline
* Methods and strategies of research: experimental ablation, recording and stimulating neural activity, Neurochemical methods, genetic methods.
* Core research areas and recent developments,
* Ethical issues in research with humans and other animals.

**Module 2: Human nervous system: structure and functions (15 hrs)**

* Human nervous system and its basic functions,
* Cells of the nervous system: neurons and glial cells and their types, the structure of a neuron, communication within a neuron, communication between neurons (the structure of the synapse, the release of neurotransmitters and activation of postsynaptic receptors, neural integration) nonsynaptic chemical communication.
* Structure of the nervous system:  basic features, anatomical directions, protective layers: the meninges, cerebrospinal fluid (CSF) system, the blood supply to the brain,
* Structure and function of the central nervous system (CNS): the forebrain (cerebral cortex, thalamus, hypothalamus, limbic system and basal ganglia) the midbrain (tectum and tegmentum), the hindbrain (pons, medulla oblongata and cerebellum), the spinal cord,
* Structure and function of the peripheral nervous system (PNS): cranial nerves, spinal nerves, the autonomic nervous system: sympathetic and parasympathetic divisions

**Module 3: Brain Development and Plasticity (12 hours) (SEMINAR)**

* The initial formulation of the nervous system, formation of major brain divisions, proliferation and cell migration, axon and synaptic formations, the development of higher cognitive abilities, the influence of genetic factors, biological, social and environmental factors on brain development.
* Organization of the brain and functions: Localization of Function, Localization and Lateralization of Language, Sequential Programming and Disconnection, Loss and Recovery of Function, Hierarchical Organization and Distributed Systems in the Brain.

**Module 4: Neurobiology of sensation and perception (17 hrs)**

* Principle neural mechanisms of sensation and perception.
* Vision: Anatomy of eye, transduction of light to an action potential, visual pathway, perception of colour, form, spatial location, orientation and movement.
* Audition: Anatomy of the ear, transduction of sound to action potentials, auditory pathway, perception of pitch, loudness, timbre, spatial location and complex sounds, music perception.
* Olfaction: Olfactory stimulus, anatomy of olfactory apparatus, olfactory pathway, perception of specific odours.
* Gustation: gustatory stimulus, anatomy of the taste buds, gustatory pathway, perception of specific tastes. Somatosenses: somatosensory stimuli, anatomy of the skin and receptive organs, somatosensory pathways, perception of cutaneous stimulation and pain.
* Vestibular sensation: anatomy of the vestibular system, transduction of movement to action potentials, vestibular pathway.

**Module 5:  Sleep, circadian rhythms, ingestive and reproductive behaviours (8 hrs)**

* Sleep: stages of sleep, physiological mechanisms of sleep and waking, biological clocks
* Reproduction: sexual development, neural and hormonal control of sexual behaviour, sexual response cycle
* Ingestion: Eating and drinking, hunger and thirst mechanisms, brain mechanisms of eating and drinking

**Suggested Activities**

* Discussions and debates on core topics
* Seminar presentations on sensory mechanisms
* Review of published case studies
* Journal reviews
* Group interactions with neuroscientists, bio psychologists and psychiatrists
* Field visits to neurological clinics and neurorehabilitation centres
* Field visits to anatomy units and brain museums

**References**

* Pinel, J. P. J., & Barnes, S. J. (2018). Biopsychology. Harlow: Pearson Education Limited.
* Carlson, N. R. (2014). Foundations of Behavioural Neuroscience. Pearson.
* Breedlove, S. M., Rosenzweig, M. R., & Watson, N. V. (2007) Biological Psychology: An introduction to behavioural, cognitive, and clinical neuroscience, 5th Edition. Sinauer Associates, Inc., Sunderland, Massachusetts.
* Breedlove, S. M., &amp; Watson, N. V. (2018). Behavioural neuroscience. Sinauer Associates, Inc., Publishers.

**Evaluation Pattern**

The course follows a continuous evaluation system with 50% weightage on internal components and 50 % on the end term examination. The internal component consists of a series of assignments which will be spread throughout the course.

**Evaluation Matrix**

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| Term Paper – project work | 10% |
| Individual assignments | 10% |
| Group assignments | 10% |
| Mid-term Examination | 20% |
| End Term Exam | 50% |
| Total | 100% |

The assignments involved in the CIA will be subject to plagiarism checks. A submission with unexplained similarities exceeding 20% for MSc courses will be reverted for resubmission. The final submission is subject to score penalization as defined by the course instructor at the start of the course, with a clear communication of the same to all the registered candidates.