



**AMITY UNIVERSITY**  
 ———— UTTAR PRADESH ————

## **FORMAT FOR COURSE CURRICULUM**

### **Course Title: Advances in Neuroscience Research**

**Course Code:**

**Credit Units: 4**

**Level: Ph.D.**

<b>L</b>	<b>T</b>	<b>S</b>	<b>SW</b>	<b>P</b>	<b>TOTAL CREDIT UNITS</b>
2	0	0	4	0	4

### **Course Objectives:**

- In this course, the students will acquire knowledge of the key areas of Neuroscience and related research areas
- The course is to focus on key aspects of neuroscience research and laboratory Equipments, test their scientific and clinical implications.

### **Pre-requisites:**

This course is open to post graduate students with a general understanding of principles of neuroscience.

### **Student Learning Outcomes:**

- Analysis of how the biological knowledge of neurological diseases is used in their modern day therapeutics
- Examine the neurological pathways involved in development of diseases
- Investigate the different sensory and motor systems and associated neuropathology
- Analyze the concepts of clinical neurological techniques and their application
- Critically examined findings in neurosciences research
- Explore the psychological and social impact of neurological diagnosis and treatment

## Course Contents/Syllabus:

	Weightage (%)
<b>Module I Principles of Neuroscience</b>	<b>20%</b>
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Brain anatomy; spinal and cranial nerves: organization and function; brain development</li><li>• Action potential, Evoked potential and propagation of nerve impulse; Voltage-Dependent Activity.</li><li>• Neurotransmitter and mechanisms of Synaptic Transmission including signal transfer.</li><li>• Neuroplasticity and rewiring of neural systems; ageing</li></ul>	
<b>Module II Sensory and Motor systems</b>	<b>30%</b>
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Auditory system: Structure, functions, anatomy and disorders of auditory pathways; Audiologic tests and audiometry</li><li>• Visual system: Retinofugal projections; Photoreceptor degeneration and its visual impact; Optical imaging; Motion perception; Object recognition and Face processing</li><li>• Olfaction: organs of smell; central olfactory pathway</li><li>• Gustation: Mechanisms of taste transduction, blending of taste &amp; odour in brain and neural pathways</li><li>• Somatosensory system: Primary somato-sensory cortex and information processing on touch</li><li>• Premotor cortex; Primary and secondary motor areas; Motor tracts &amp; motor neurons</li></ul>	
<b>Module III Clinical Neuroscience</b>	<b>30%</b>
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Neurodegenerative, Neuroinfectious diseases, Neuropsychiatric disorders; Head injury, spinal cord injury; Meningioma, Gliomas, Medulloblastoma, Astrocytoma</li><li>• Applications of neuroimaging techniques in clinical research; Computed tomography (CT) scanning, contrast-enhanced computed tomography (CECT), Magnetic Resonance Imaging (MRI)</li><li>• Functional tests such as Electromyogram (EMG), Electroencephalogram (EEG) and Functional Imaging like Single-photon emission computed tomography (SPECT)</li><li>• Neurological examination: Mental status examination, Cranial nerve function test, Motor examination, Sensory examination, Nerve conduction studies</li><li>• Therapeutic approaches to neurological diseases</li></ul>	
<b>Module IV Neuroinformatics and Systems Biology</b>	<b>20%</b>
<b>Descriptors/Topics</b> <ul style="list-style-type: none"><li>• Neuroinformatics: Concepts and Applications; Neural coding and dynamics; Theoretical methods for studying neural coding in individual neurons and populations of neurons</li></ul>	

<ul style="list-style-type: none"> <li>• Artificial intelligence and its applications in Neurosciences</li> <li>• Voltage-clamp experimental analysis of results Hodgkin-Huxley and related models of neural excitability and its use to simulate ionic conductance</li> <li>• Next generation sequencing and its applications</li> <li>• Modern methods of imaging neural activity</li> <li>• Gene ontology; Structure and dynamics of Proteins and Nucleic Acids</li> </ul>	
---	--

**Pedagogy for Course Delivery:**

Lectures: 28  
 Class Test: 1  
 Seminar /Presentation 1

**Assessment/ Examination Scheme:**

**Theory Assessment (L&T):**

Continuous Assessment/Internal Assessment					End	Total
Components (Drop down)	Class Test	Presentation	Viva	Attendance	Term Examination	
Weightage (50%)	10	10	5	5	70	100

**Text & References:**

1. Principles of Neural Science, 5th ed., Kandel, Schwartz, & Jessell
2. Neuroscience: Exploring the Brain, 3rd Edition by Mark F. Bear, Barry W. Connors , Michael A. Paradiso