

12/10/2015

**Curriculum (2015-17)**

Semester	Course code	Title of the Paper (s)	Course type	Credits				
				L	T	P	Total	
FIRST	NS-101	Cell Biology and Neuron organization	Core	3	0	0	3	
	NS-102	Neuroanatomy	Core	3	0	0	3	
	NS-103	Genetics and Molecular Biology	Core	3	0	0	3	
	NS-104	Laboratory Tools and Techniques	Core	3	0	0	3	
	NS-105	Practical- Cell Biology and Genetics	Core	0	0	3	3	
	NS-106	Practical- Neuroanatomy	Core	0	0	3	3	
	NS-107	Assignment/Personality and skill development	Core	0	1	0	1	
	NS-108	Seminar-I	Core	0	1	0	1	
	<b>Total valid credits</b>							<b>20</b>
		NS-109	Comprehensive viva-voce exam	Virtual credits			4	4
<b>Total credits for First Semester (Valid Credits+ Virtual Credits)</b>							<b>24</b>	
SECOND	NS-201	Biochemistry	Core	3	0	0	3	
	NS-202	Neurochemistry	Core	3	0	0	3	
	NS-203	Developmental Neurobiology	Core	3	0	0	3	
	NS-204	Cellular Neurophysiology and Biophysics	Core	3	0	0	3	
	NS-205	Practical-Biochemistry and Molecular Biology	Core	0	0	3	3	
	NS-206	Practical- Neurophysiology	Core	0	0	3	3	
	NS-207	Assignment/Personality and skill development	Core	0	1	0	1	
	NS-208	Seminar-II	Core	0	1	0	1	
	<b>Total valid credits</b>							<b>20</b>
		NS-209	Comprehensive viva-voce exam	Virtual credits			4	4
<b>Total credits for Second Semester (Valid Credits+ Virtual Credits)</b>							<b>24</b>	
THIRD	NS-301	Immunology	Core	3	0	3	3	
	NS-302	Systems Neuroscience-I: Sensory and Motor Systems	Core	3	0	3	3	
	NS-303	Systems Neuroscience-II: Regulatory Systems	Core	3	0	3	3	
	NS-304	Behaviour and Cognitive Neuroscience	Core	3	0	3	3	
	NS-305	Practical- Neuropathology	Core	0	0	3	3	
	NS-306	Practical- Behavior Biology	Core	0	0	3	3	
	NS-307	Assignment/Personality and skill development	Core	0	1	0	1	
	NS-308	Seminar-III	Core	0	1	0	1	
	<b>Total valid credits</b>							<b>20</b>
		NS-309	Comprehensive viva-voce exam	Virtual credits			4	4
<b>Total credits for Third Semester (Valid Credits+ Virtual Credits)</b>							<b>24</b>	
FOURTH	NS-401	Clinical Neurochemistry and Neuropathology	Core	3	0	0	3	
	NS-402	Practical	Core	0	0	3	3	
	NS-403	Project	Core	12	0	0	12	
	NS-404	Assignment/Personality and skill development	Core	0	0	1	1	
	NS-405	Seminar-IV	Core	0	0	1	1	
	<b>Total valid credits</b>							<b>20</b>
	NS-406	Comprehensive viva-voce exam	Virtual credits					
<b>Total credits for Fourth Semester (Valid Credits+ Virtual Credits)</b>							<b>24</b>	





**JIWAJI UNIVERSITY, GWALIOR**  
**MASTER OF SCIENCE (M.Sc.) IN NEUROSCIENCE**

**Goal and Objectives:**

The major goal of introducing a M.Sc. Neuroscience course is for development of trained manpower having a broad overview of the different aspects of neuroscience. It is planned to teach this course at the postgraduate level, imparting the broad perspective of the different disciplines, which comprise neuroscience over a two-year period.

**The Training:**

It is hoped that the M.Sc. Neuroscience programme would offer training in neuroscience to graduates who would then be well equipped to take up their Ph.D. work in specific areas of brain research. The students with a M.Sc. in Neuroscience Degree would have acquired the basic knowledge in major disciplines of neuroscience, such as neuroanatomy, neurophysiology, neurochemistry, molecular neurobiology, neurogenetics, cognitive neuroscience and the knowledge of working of motor, sensory and regulatory systems. The development and regeneration of the brain as well as the knowledge in basics of clinical neuroscience in terms of diseases and diagnostic tools would also be provided. The students would also acquire practical knowledge in the above aspects as well as in research methodology and computational skills.

**SYLLABUS (2015-2017)**

Master of Science in Neuroscience course shall comprise of four semesters of six months duration each. The following is a summary of the course, which is followed by detailed descriptions:

**M.Sc. Neuroscience: Theory and Practical Courses\*****Semester-I**

Code	Title	Credits
NS/101	Cell Biology and Neuron Organization	3
NS/102	Neuroanatomy	3
NS/103	Genetics and Molecular Biology	3
NS/104	Laboratory Tools and Techniques	3
NS/105	Practical-Cell Biology & Genetics	3
NS/106	Practical-Neuroanatomy	3
NS/107	Assignment/Personality and skill development	1
NS/108	Seminar-I	1
NS/109	Comprehensive Viva-voce exam	4
<b>Total=</b>		<b>24</b>

**Semester-II**

Code	Title	Credits
NS/201	Biochemistry	3
NS/202	Neurochemistry	3
NS/203	Developmental Neurobiology	3
NS/204	Cellular Neurophysiology and Biophysics	3
NS/205	Practical-Biochemistry and Molecular Biology	3
NS/206	Practical-Neurophysiology	3
NS/207	Assignment/Personality and skill development	1
NS/208	Seminar-II	1
NS/209	Comprehensive Viva-voce exam	4
<b>Total=</b>		<b>24</b>

**Semester-III**

Code	Title	Credits
NS/301	Immunology	3
NS/302	Systems Neuroscience-I: Sensory and Motor Systems	3
NS/303	Systems Neuroscience-II: Regulatory System	3
NS/304	Behaviour and Cognitive Neuroscience	3
NS/305	Practical-Neuropathology	3
NS/306	Practical-Behavior biology	3
NS/307	Assignment/Personality and skill development	1
NS/308	Seminar-III	1
NS/309	Comprehensive Viva-voce exam	4
<b>Total=</b>		<b>24</b>

**Semester-IV**

Code	Title	Credits
NS/401	Clinical Neurochemistry and Neuropathology	3
NS/402	Practical	3
NS/403	Project	12
NS/404	Assignment/Personality and skill development	1
NS/405	Seminar-IV	1
NS/406	Comprehensive Viva-voce exam	4
<b>Total=</b>		<b>24</b>





## Detailed Syllabus (2015-2017)

### Semester-I (Credits 24)

#### NS/101: CELL BIOLOGY AND NEURON ORGANIZATION

Credits=3

**Note:** Neurons contain the same intracellular components, as do other cells. Understanding of brain function would absolutely need a clear understanding of the cellular and molecular organization of neurons and glia as units. Thus in this paper the student is expected to learn in greater details the sub-cellular and molecular organization of neurons and glia. The paper to be taught in about 40 lectures each of 90 minutes duration. In view of the explosion of knowledge in Cell Biology we have tried to detail out the important aspects in each topic to easily confine to a limit in teaching.

#### Unit-I

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

#### Unit-II

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

#### Unit-III

10. An overview of the nervous system
11. Neurons: Introduction to neurons, The Neuron Doctrine, The Nissl and Golgi stains, Components of neurons
12. Classification and types of neurons, Cytology of neurons
13. Dendrites structure and function, Axons structure and functional aspects, myelination and synapses

#### Unit-IV

14. Glial cells: Structure and function of glial cells, Different types of glial cells: astrocytes, oligodendrocytes and Schwann cells
15. Types of astrocytes – type I & II astrocytes, fibrous and protoplasmic astrocytes, Importance of astrocytes in glutamate metabolism and blood brain barrier
16. Functions of other glial cells: oligodendrocyte and microglial cells, Microglial phenotypes,
17. Overview of glial and neuronal relationship in the CNS
18. Glial-neuronal interplay in the CNS

#### Suggested Books:

1. Siegel, Basic Neurochemistry (7<sup>th</sup> Edition) Academic Press, 2006
2. Albertes, Molecular Biology of the Cell (5<sup>th</sup> Edition) Garland Science, 2008
3. Kendel, Principles of Neural Science (5<sup>th</sup> edition), McGraw Hill, 2013
4. Verkhratsky, Glial Neurobiology, A Text Book, Wiley, 2007

#### NS/102: NEUROANATOMY

Credits=3

**Note:** It is expected that a student of M. Sc. Neuroscience should have basic understanding of the anatomical organization of the nervous system during the 1<sup>st</sup> semester so that he/she is able to correlate the functional aspects in subsequent stages of learning.

#### Unit-I

1. Gross anatomy of the adult brain; organization of the nervous system
2. Subdivisions of the nervous system; Concept of CNS, ANS & PNS
3. The scalp, skull and meninges
4. Cerebrospinal fluid
5. Constitutions of CNS: Overview; Neuronal elements, basic circuit, synaptic action, dendritic properties and functional operation of axons

#### Unit-II

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;

