

SEMESTER II
LSM3213 – MOLECULAR & CELLULAR NEUROBIOLOGY

Prerequisite: LSM2102 and LSM2103

Workload: 26 lecture hours + 12 tutorial hours + 12 practical/SDL hours

This module aims firstly to introduce third-year students to neurobiology and secondly to impart fundamental concepts and principles in neurophysiology, neuropharmacology, neurochemistry and cell biology of the nervous system. The fascination with how the brain works remains to this day and it is still very much a mystery. The first step on this quest begins with understanding the fundamental principles underlying the molecular and cellular functions of neuronal and glial cells, the building blocks of the brain. This module seeks (1) to inform; (2) to challenge on the basis that scientific enquiry is uncertain while knowledge is tentative and (3) to relate neurobiology to our lives. The topics include: (1) Neuronal signalling; (2) Mechanisms of neurotransmission; (3) Neuronal growth, regeneration and degeneration and (4) Glial function and neurogrowth factors.

S/N	Topics	Lecture hours
1.	<u>Neuronal Signalling & Neurophysiology</u> <ul style="list-style-type: none"> • Brief introduction on functional anatomy of the brain • Ionic basis of generation and maintenance of resting membrane potential and action potential • Molecular biology of voltage-gated ion channels involved in electrical signalling • Mechanism of neuromuscular excitation-contraction coupling • Channelopathies: ion channel disorders 	6
2.	<u>Mechanisms of neurotransmission & neuropharmacology</u> <ul style="list-style-type: none"> • Role of neurotransmitters in synaptic signalling • mechanisms of neurotransmitter release • Molecular biology of neurotransmitter receptors involved in reception of chemical signals • Formation of synapse at the neuromuscular junction and central synapse • Integration of synaptic signals 	6
3.	<u>Neuronal growth, regeneration and degeneration</u> <ul style="list-style-type: none"> • Neuronal polarity: membrane dynamics and trafficking in neurons • Neuronal growth and developmental pathfinding; neuronal regeneration and inhibitors of regeneration • Neuronal death and neurodegeneration 	6
4.	<u>Glial functions and neurogrowth factors</u> <ul style="list-style-type: none"> • Glial – cell and molecular biology • Cellular and molecular biology of neurogrowth factors (NGF/GDNF) and receptors • Molecular and cellular aspects of Parkinson's disease 	6
5	<u>Protein aggregation and neurodegeneration</u>	2
Total Lectures: 26h		
Tutorials/CA: 12h		
Practicals/SDL: 12h		
Total hours:		50h

TEXT BOOK:

1. Neuroscience: Exploring the Brain - Mark F. Bear, Barry W. Connors and Michael A. Paradiso.
2. Essentials of Neural Science and Behavior - Eric R. Kandel, James H. Schwartz and Thomas M. Jessell
3. The Neuron: Cell and Molecular Biology - Irwin B. Levitan and Loenard K. Kaczmarek

MODE OF ASSESSMENT: 20% CA, 20% SDL and .60% Final Exam

MODULE CO-ORDINATOR:

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