NS3002: LEARNING AND MEMORY

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Learning and Memory

Subject Code
NS - Neuroscience
Course Number
3002

Academic Unit
Neuroscience (NS)

College/School
College of Biomedicine (BD)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
How our brain learns new information and skills, store and retrieve knowledge has fascinated neuroscientists and philosophers for generations and continue to inspire research endeavours encompassing diverse scientific approaches. In

this course, we will provide a broad introduction to the neurobiology of learning and memory for students who are curious about such topics.

This course is designed to reflect the breadth and vibrancy of this field touching upon topics that have animated decades of investigation as well as modern theory and technologies of studying learning and memory. Selected lectures include animal models in the investigation of learning and memory, cellular mechanisms of synaptic plasticity and reinforcement learning, neuroregulation of learning and memory, learning and memory impairment, and artificial neural networks for machine learning.

The objective of this course is to enable students to grasp the scientific insights and to cultivate their interests in pursuing a career in neuroscience.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the basic phenomenology, history, categories of learning and memory		x	x	
2	Describe classical vertebrate and invertebrate animal models and modern approaches in the investigation of learning and memory, as well as innovative therapeutic approaches.		x	x	x
3	Explain the current theories of regulation of learning and memory performance.		x	x	x
4	Understand cellular and molecular mechanisms of synaptic plasticity related to learning and memory.		x	x	x
5	Understand the concept and design of artificial neural network and machine learning and its potential applications.		x	x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Teaching and learning based on a combination of lectures and models to explain the fundamental principles and experiments in learning and memory	1, 2, 3, 4, 5	2 hours / week

2	Tutorials and group discussions	Interactive sessions based on questions and answers	1, 2, 3, 4, 5	1 hour / week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial Quizzes	1, 2, 3, 4, 5	40	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

Tutorial Quizzes

Criterion

Understand the basics and fundamentals of scientific knowledge and the experimental designs

Excellent (A+, A, A-)

Demonstrates a high level of understanding of knowledge and experimental designs regarding learning and memory and the ability to describe these issues in written form.

Good (B+, B, B-)

Demonstrates a well-developed understanding of basic knowledge and experimental designs regarding learning and memory and the ability to describe these issues in written form.

Fair (C+, C, C-)

Demonstrates a moderate level of understanding of basic knowledge and experimental designs regarding learning and memory and the moderate ability to describe these issues in written form.

Marginal (D)

Demonstrates a rudimentary understanding of basic knowledge and experimental designs regarding learning and memory and the rudimentary ability to describe these issues in written form.

Failure (F)

Fail to understand the basics or lack the ability to describe these issues in written form.

Assessment Task

Final Examination

Criterion

Ability to understand the models and technologies, and posses critical thinking skills and know how to use neuroscience knowledge to solve real-life problems

Excellent (A+, A, A-)

Demonstrates a high level of understanding of models and approaches regarding learning and memory research and the ability to use this knowledge to design research experiments.

Good (B+, B, B-)

Demonstrates a well-developed understanding of models and approaches regarding learning and memory research and the ability to use this knowledge to design research experiments.

Fair (C+, C, C-)

Demonstrates a moderate level of understanding of models and approaches regarding learning and memory research and the ability to use this knowledge to design research experiments.

Marginal (D)

Demonstrates a rudimentary understanding of models and approaches regarding learning and memory research and the ability to use this knowledge to design research experiments.

Failure (F)

Fail to understand the basics of learning and memory research or lack the ability to use this knowledge to design research experiments.

Part III Other Information

Keyword Syllabus

Learning
Memory
Neuroscience
Neural network
Neural circuit
Synaptic plasticity
Memory consolidation
Memory retrieval
Addiction
Reinforcement learning
Neural coding
Prior knowledge
Neuron-glia interaction
Spatial learning
Motor learning
Machine learning

Reading List

Compulsory Readings

	Title
1	We set no compulsory textbooks for the course. All materials the students need will be made available throughout the course.

Additional Readings

	Title
1	Nil