

NS3002: LEARNING AND MEMORY

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Learning and Memory

Subject Code

NS - Neuroscience

Course Number

3002

Academic Unit

Neuroscience (NS)

College/School

Jockey Club College of Veterinary Medicine and Life Sciences (VM)

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 DEC-A1 DEC-A2 DEC-A3 app.)			
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.		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	Describe animal models in investigating impaired learning and memory and innovative therapeutic approaches.		x	x	x
6	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.

Teaching and Learning Activities (TLAs)

TLAs	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, 6	2 hours / week
2	Tutorials and group discussions	Interactive sessions based on questions and answers	1, 2, 3, 4, 5, 6	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, 6	50	

Continuous Assessment (%)

50

Examination (%)

50

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 possess 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