City University of Hong Kong
Course Syllabus

offered by Department of Neuroscience
with effect from Semester A 2024/2025

Part I Course Overview

Course Title:	Neural Basis of Learning and Memory
Course Code:	NS5003
Course Duration:	One semester
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. 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 neural basis 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 in a neuroscience-related career path.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Understand the basic phenomenology, history, categories of learning and memory research. Describe classical vertebrate and invertebrate animal models and modern approaches in the investigation of learning and memory.		✓	✓	
2.	Explain the current theories of regulation of learning and memory performance. Understand cellular and molecular mechanisms of synaptic plasticity related to learning and memory.		✓	✓	✓
3.	Describe animal models and experimental designs in investigating impaired learning and memory and innovative therapeutic approaches. Understand the concept and design of artificial neural network and machine learning and its potential applications.		✓	✓	✓
		100%			

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.

3. Learning and Teaching Activities (LTAs)

LTA	Brief Description	CILO No.			Hours/week (if applicable)
		1	2	3	
Lectures	Teaching and learning based on a combination of lectures and models to explain the fundamental principles and experiments in learning and memory	✓	✓	✓	2 hours / week
Tutorials and group discussions	Interactive sessions based on questions/answers and quizzes	✓	✓	✓	1 hour / week

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.			Weighting	Remarks
	1	2	3		
Continuous Assessment: 40%					
Tutorial Quizzes	✓	✓	✓	40%	
Examination: 60%					
Final Examination (duration: 2 hours)	✓	✓	✓	60%	
				100%	

5. Assessment Rubrics

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1.Tutorial Quizzes	Understand the basics and fundamentals of scientific knowledge and the experimental designs	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.	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.	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.	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.	Fails to understand basic knowledge and experimental designs regarding learning and memory and lack the rudimentary ability to describe these issues in written form.
2.Final Examination	Ability to understand the models and technologies, and possess critical thinking skills and know how to use neuroscience knowledge to solve real-life problems					

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1.Tutorial Quizzes	Understand the basics and fundamentals of scientific knowledge and the experimental designs	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.	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.	Demonstrates a rudimentary level of understanding of basic knowledge and experimental designs regarding learning and memory and the rudimentary ability to describe these issues in written form.	Fails to understand basic knowledge and experimental designs regarding learning and memory and lack the rudimentary ability to describe these issues in written form.
2.Final Examination	Ability to understand the models and technologies, and possess critical thinking skills and know how to use neuroscience knowledge to solve real-life problems				

Part III Other Information

1. 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

2. Reading List

2.1 Compulsory Readings

N/A

2.2 Additional Readings

1.	"The Neurobiology of Learning and Memory", Third Edition, by Jerry W. Rudy, 2021