

**City University of Hong Kong
Course Syllabus**

**offered by Department of Neuroscience
with effect from Semester A 2023/2024**

This form is for the completion by the *Course Leader*. The information provided on this form is the official record of the course. It will be used for the City University's database, various City University publications (including websites) and documentation for students and others as required.

Please refer to the Explanatory Notes on the various items of information required.

Prepared / Last Updated by:

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Part I Course Overview

Course Title:	<u>Molecular and Cellular Neuroscience</u>
Course Code:	<u>NS5004</u>
Course Duration:	<u>One semester</u>
Credit Units:	<u>3</u>
Level:	<u>P5</u>
Medium of Instruction:	<u>English</u>
Medium of Assessment:	<u>English</u>
Prerequisites: (Course Code and Title)	<u>NIL</u>
Precursors: (Course Code and Title)	<u>NIL</u>
Equivalent Courses: (Course Code and Title)	<u>NIL</u>
Exclusive Courses: (Course Code and Title)	<u>NIL</u>

Part II Course Details

1. Abstract

Understanding the molecular and cellular mechanisms of neuronal function is not only crucial for gaining fundamental insights into how the brain works, but is also pivotal to identify new therapeutic targets for various brain disorders. This course aims to (1) equip students with the basic knowledge of molecular events, signal transduction pathways and cellular specializations within the brain; (2) introduce some of the latest frontiers on understanding how neurons function at the molecular and cellular levels; and (3) describe the latest technologies and tools in studying neuronal function. This interdisciplinary course provides detailed explanation on the molecular and cellular basis of various neuronal processes, with focus on intracellular transport, formation and plasticity of synapses, as well as molecular and cellular aberrations during neurodegeneration and neurodevelopmental disorders. Through wide range of teaching activities including tutorial discussions, paper presentations and essay writing, we aim to inspire students on the different fascinating aspects of molecular and cellular neuroscience.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Describe the major molecular pathways and cellular compartments that control various neuronal functions			✓	✓
2.	Develop critical thinking skills to evaluate the key concepts and new discoveries in molecular and cellular neuroscience		✓	✓	✓
3.	Apply the core knowledge in the molecular compositions of neuron to explain how their abnormalities affect normal brain function in specific disorders		✓	✓	✓
4.	Understand the principles behind key experimental approaches in molecular and cellular neuroscience research		✓	✓	✓
		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 self-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. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Lectures	Provide the essential knowledge about the molecular and cellular basis of neuronal functions	✓	✓	✓	✓			
Laboratory sessions	Provide students to experience the techniques used in current molecular and cellular neuroscience research		✓		✓			
Tutorial	Provide opportunities for discussion, further explanation of concepts and problem-solving	✓	✓	✓	✓			

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4				
Continuous Assessment: <u>40</u> %								
Laboratory Reports	✓	✓	✓	✓			20%	
Mid-term exam/Quizzes	✓	✓	✓	✓			20%	
Examination: <u>60</u> % (duration: 2 hours)								
							100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Mid-term and Final exam	To test students' application of material taught in class and evaluate their performance based on their performance on the exam	Excellent level of achievement. Students demonstrate mastery in their understanding of neuroscience concepts; express their ideas fluently; show clear evidence of strong critical thinking and integration of relevant materials.	Good level of achievement. Students show thorough understanding of neuroscience concepts; express their ideas well; demonstrate critical thinking and have suitable reading and integration of relevant materials.	Satisfactory level of achievement. Students show some understanding of neuroscience concepts; express coherently; demonstrate some evidence of critical thinking and some reading and integration of relevant materials.	Unacceptable level of achievement. Students are unfamiliar with neuroscience concepts; cannot communicate effectively; do not show original thought and critical thinking, and have not read or integrated relevant materials.
2.Laboratory Reports	To test students' application of materials taught in class into experimental design	Excellent level of understanding of practical aspects of some of the cellular experiments for neuroscience	Good level of understanding of practical aspects of some of the cellular experiments for neuroscience	Satisfactory level of understanding of practical aspects of some of the cellular experiments for neuroscience	Unacceptable level of understanding of practical aspects of some of the cellular experiments for neuroscience

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Cytoskeleton composition and dynamics
Dendritic spine development and remodelling
Gene transcription
Genome editing
Neurotrophic factors and their receptors
Human induced pluripotent stem cells and neural differentiation
Intracellular transport
Learning and memory
Microscopy in neurobiology
Post-translation modification of protein
Protein synthesis
RNA (mRNAs and non-coding RNAs)
RNA interference
Signal transduction
Synaptic plasticity
Synapse

2. Reading List

2.1 Compulsory Readings: NIL

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

N/A

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	The synapse: structure and function Edited by: Virginia Pickel and Menahem Segal 2014 Academic Press
2.	Methods in cell biology. The neuronal cytoskeleton, motor proteins, and organelle trafficking in the axon. Volume 131 Edited by Kevin Pfister 2016 Academic Press
3.	Neuroscience: exploring the brain by Mark Bear, Barry Connors and Michael A. Paradiso. 4 th Edition