Neuroscience (Major/Minor)-For students who newly declare in or after 2023/2024

Important notes about choosing Neuroscience as second major or minor

a. Declaration of Neuroscience major/minor is not available via the SIS during course selection period or add/drop period. Students who would like to declare major/minor in Neuroscience are required to submit an application form to the Department of Psychology one week before the end of add/drop period each semester. Candidates will be vetted based on academic history, including, but not limited to his/her background in the sciences, and overall academic performance. Successful candidates will be informed about the declaration result after add-drop period each semester.
b. For FAQ on the neuroscience programme, please click here.
c. For enquiries, please contact Ms Joey Lau at ugpsyc@hku.hk

Neuroscience is the interdisciplinary study of the structure and function of the nervous system. This programme focuses on the neural mechanisms underlying behavior cognition and perception in humans, both in health and disease (although students will be exposed to findings from animal studies as well). Students will be given rigorous academic training, from a variety of disciplines, to prepare them for further studies and research, as well as to be able to eventually translate the relevant knowledge into practical applications. Apart from academic careers and further medical training in areas such as cognitive neuroscience, psychology, neurology, and psychiatry, other career paths include computer science, education, artificial intelligence, public policy, marketing, medicine, and pharmacology etc., as they all benefit from a basic training in neuroscience.

I. Objectives:

The mission of this Neuroscience programme is to provide high quality undergraduate education in neuroscience using a multi-disciplinary approach. This programme combines basic science with more specialized courses in neuroscience and psychology. Students can take this neuroscience programme as a second major, or as a minor in addition to their declared primary major. The objectives of the programme are set out below:

a) provide students with exposure to and a fundamental understanding of neuroscience and its related fields in a multi-disciplinary approach
b) develop students' ability to critically analyze scientific research
c) equip students with basic theoretical and methodological training that enable their successful pursuit of further study at the postgraduate level in neuroscience or related disciplines
d) enhance students' awareness of social issues as the neuroscience training will equip them with the background to understand controversies in neuroscience or related disciplines.

II. Programme Structure

Components	No. of Credits	
	Major	**Minor**
a) Introductory courses		
i) disciplinary	6	6
ii) pre-requisites*	12	-
b) Advanced courses		
iii) core courses	24	24
iv) disciplinary electives	24	6
v) capstone experience	6	-

** Candidates who opt to declare two major programmes offered by the Faculty of Social Sciences should avoid selecting overlapping pre-requisites.*

Notes:

- *A course will be counted as fulfilling the major/minor requirement only if it is not taken as fulfilling another curriculum requirement.*
- *The major# option/minor option is open to all HKU undergraduates. Candidates are required to have Level 3/above in HKDSE Biology, Chemistry or Combined Science OR equivalent courses. Those without a science background before entering University can consider taking introductory science courses such as* CHEM1041 Foundations of chemistry, SCNC1112 Fundamentals of modern science *to demonstrate their proficiency in the sciences (subject to the approval from the Department of Psychology), before enrolling in the neuroscience core courses.*

(#Neuroscience programme could only be taken as a multidisciplinary / second major)

Candidates who wish to declare a major (72 credits) or minor (36 credits) in Neuroscience must complete the following. In view of the pre-requisite requirements for advanced disciplinary electives which will have implications for students' course choice and study load, students should approach the Department of Psychology if they intend to declare the major/minor so that proper academic advising and mentoring can be given. Prior approval from the Department is required before students can declare the major/minor.

a) Introductory courses (18 credits for major, 6 credits for minor) Note@

i) All candidates must complete the following disciplinary course:
PSYC1001. Introduction to psychology (6 credits)

ii) Pre-requisite courses (12 credits)

Candidates who major in this programme must complete two pre-requisite courses at introductory level from any faculties, bearing in mind the pre-requisite requirements for courses listed in the "Disciplinary Electives", and take the relevant pre-requisite courses as necessary.

For non-BSocSc students, they shall select PSYC1004 Introduction to quantitative methods in psychology or a similar statistics course from another department (e.g. STAT1005 Essential skills for undergraduates: Foundations of Data Science) to fulfill one of their pre-requisite requirements, and make up the rest 6 credits by taking any introductory course of which should be the pre-requisite course of an advanced course in neuroscience curriculum from any faculties.

Students may also consider taking the course COMP1117 Computer programming to better prepare for further research in the capstone experience or thesis in neuroscience.

Note@: Should there be an overlap of introductory courses for the two majors, candidates will be exempted from such requirements for neuroscience major and are required to make up any credit shortfall arising from such double-counting by taking disciplinary electives.

b) Advanced courses (54 credits for major, 30 credits for minor)

i) Core courses (24 credits for both major and minor)

Candidates who major or minor in this programme must complete the following courses.

PSYC2101.	Foundations of neuroscience I (6 credits)
PSYC2103.	Foundations of neuroscience II (6 credits)
PSYC2111.	Neurobiological basis of psychological issues (6 credits)
PSYC3054.	Human neuropsychology (6 credits)

ii) Disciplinary electives (24 credits for major, 6 credits for minor) Note#

Candidates who **major** in this programme must complete 24 credits from the course list below in which 12 credits must be from the stream of "Neuroscience electives" and the rest of the credits from "Other electives". These 24 elective credits must be offered by at least two different departments.

Candidates who **minor** in this programme must complete at least 1 elective from either stream of "Neuroscience electives" or "Other electives". These 6 elective credits must be offered outside the Department of Psychology.

In the interest of deepening the understanding of subject matters taught in the field of Neuroscience, candidates who wish to minor in Neuroscience may also take the introductory course PSYC1004 Introduction to quantitative methods in psychology as free elective in addition to the completion of the disciplinary electives.

In sum, the following courses offered by different departments are grouped under two streams. Candidates who major/minor in Neuroscience are required to complete at least 24/6 credits from the courses listed below and these elective credits must include at least one disciplinary elective course offered outside the Department of Psychology.

First Stream "Neuroscience electives"

PSYC2102.	Seminar in neuroscience (6 credits)
PSYC2110.	Developmental neuroscience (6 credits)
PSYC2112.	Research internship in neuroscience (6 credits) *
PSYC2113.	Introduction to brain imaging (6 credits)
PSYC2114.	Special topics in neuroscience (6 credits)
PSYC4101.	Thesis in neuroscience (12 credits) *
BBMS3011.	Molecular neuroscience (6 credits)

*Internship/thesis (For major only)

Second Stream "Other electives"

BIOL3105.	Animal physiology & environmental adaptation (6 credits)
BBMS3012.	Stem cell biotechnologies in regenerative medicine (6 credits)
BMED3501.	Medical imaging (6 credits)
PSYC2007.	Cognitive psychology (6 credits)
PSYC2051.	Perception (6 credits)

Note#: In course registration, students should pay special attention to the prerequisite of courses as specified in the syllabuses. They must complete relevant pre-requisite courses before taking corresponding disciplinary electives. In exceptional cases these maybe waived.

iii) Capstone experience (for major only)
Candidates who major in this programme must complete one of the following courses:

PSYC3061.	Advanced issues in perception (6 credits)
PSYC3068.	Advanced cognitive psychology (6 credits)
PSYC4102.	Capstone project in neuroscience (6 credits)

Important note: The courses being offered in a particular year is subject to change. Students are advised to see the Recommended Study Pathway to plan ahead in your course selection. In course registration, students should pay special attention to the prerequisite of courses as specified in the syllabuses.

Course Descriptions for PSYC courses

PSYC1001. Introduction to psychology (6 credits)
Discussion of basic concepts in psychology and a preliminary survey of representative work carried out in various areas of psychological investigation, together with an investigation at some length of one such area.
Assessment: 100% coursework

PSYC2007. Cognitive psychology (6 credits)

This course covers how humans process information from the environment. Topics include various aspects of perception, attention, memory, imagery, language and decision-making. Students will learn from attending lectures and active participation during tutorials. Students will also conduct experiments about cognitive functioning and learn to critically evaluate existing studies in the research literature and to write research reports on experimental findings.
Assessment: 100% coursework
Prerequisites: PSYC1001 and PSYC1004

PSYC2051. Perception (6 credits)

An introduction to sensation and perception with an emphasis on the psychology of seeing. Specific topics include the following: examination of the functional properties of sensory systems (e.g., auditory system, color vision, vestibular system, touch and kinaesthesia); phenomenology of sensation and perception; psychophysical limits of perceptual systems; goals of sensory coding; structure and evolution of sensory systems; theories of perception. Perceptual experiments will be conducted by students in laboratory classes.
Assessment: 100% coursework
Prerequisite: PSYC1001

PSYC2101. Foundations of neuroscience I (6 credits)

This course covers the fundamental principles of neuroscience. Topics include history of neuroscience, neurons and glia, neuronal membrane at rest, action potential, synaptic transmission, neuroanatomy, the somatic sensory system, chemical senses: taste and smell. the auditory system, vision and the eye, vision and the brain, spinal control of movement, brain control of movement, chemical control of the brain and behavior, development in the nervous system, memory systems, learning and memory: molecular biology, emotion and attention. (Priority will be given to students planning to major in neuroscience)
Assessment: 100% coursework
Prerequisite: PSYC1001

PSYC2102. Seminar in neuroscience (6 credits)

This course surveys key topics in neuroscience research. Students will be reading, analysing, and evaluating classical and cutting-edge research studies. Throughout the course, students will be able to learn research methods in cellular and system neuroscience, and their applications in research of neurological and psychiatric syndromes. Students will be able to apply the basic concepts and technological knowledge on various experimental methods for neuroscience investigation, as well as be able to critically evaluate empirical research. In-class activities will include presentations and discussions, among other activities. (Priority will be given to students planning to major in neuroscience)

Assessment: 100% coursework
Prerequisite: PSYC2101

PSYC2103. Foundations of neuroscience II (6 credits)

This course complements the first course in this series, Foundations of Neuroscience I, covering the fundamental principles of neuroscience. This second course will familiarise students with principles related to chemical control of the brain (e.g., homeostasis, hypothalamic control, and relevance to behaviour), the autonomic nervous system, and diffuse modulatory systems (e.g., noradrenergic, serotonergic, dopaminergic, and cholinergic regulation). This course will culminate with a series of introductory programming modules to prepare students for advanced research at the undergraduate and graduate levels. Priority will be given to students majoring/minoring in neuroscience.
Assessment:100% coursework.
Prerequisite: PSYC1001 and PSYC2101

PSYC2110. Developmental neuroscience (6 credits)

Developmental neuroscience is an interdisciplinary research topic that integrates neuroscience, cognitive science and developmental science. This course aims to uncover the brain and neural mechanisms that underlie social, affective and cognitive development across the life span. Specific topics will include the introduction of theories and methods in developmental neuroscience, neuroplasticity, neural mechanisms that underlie the development of attention and perception processes, motor learning, memory, cognitive control, social-emotional processes. This course will examine these processes at different developmental stages, including infants, toddlers, adolescence and ageing population. This course will also cover the neural mechanisms underlying atypical development such as the Autism Spectrum Disorder (ASD).
Assessment: 70% coursework, 30% examination
Prerequisite: PSYC2101

PSYC2111. Neurobiological basis of psychological issues (6 credits)

Human behavior is generated by complex psychophysiological mechanisms of the brain. This course is designed to provide a broad introduction to the biological basis of stress, emotion, and regulation of cognitive-affective processes affecting psychological health. The neurobiological basis of psychopathologies e.g. depression, anxiety, will be examined as examples to demonstrate the complex relationships between brain, behavior, and psychopathology.
Assessment: 100% coursework.
Prerequisite: PSYC1001.

PSYC2112. Research internship in neuroscience (6 credits)

(For neuroscience major) Students will have an opportunity to learn to do research as an intern in ongoing empirical research projects under a teacher's supervision in the Department of Psychology. Students spend 10-12 hours per week assisting various research activities. The internship includes participating in lab meetings or meeting individually with the supervisor, reading relevant theoretical and empirical articles, assisting in ongoing empirical research projects, and writing an internship report. Information about research projects offering internship placements and application procedure will be available in the Psychology Department webpage.
Assessment: 100% coursework
Prerequisite: PSYC2101

PSYC2113. Introduction to brain imaging (6 credits)

Functional Magnetic Resonance Imaging (fMRI) is widely used to study brain functions. This course is designed to provide a general introduction to the physical and physiological bases and principles of fMRI, MRI related safety issues, and design and analysis of fMRI experiments.
Assessment: 100% coursework.
Prerequisite: PSYC1001 and PSYC1004.

PSYC2114. Special topics in neuroscience (6 credits)

This course will cover selected topics in specialized areas of neuroscience. Students may be required to participate in seminars, conduct reporting and original research, and write one or more papers. The aim of the course is to develop a significant level of understanding and insight into issues that have an impact on the contemporary neuroscience research and applications. Topics will vary depending on the year offered, and will be subject to approval by the Programme Coordinator. The course may not be repeated.

Assessment: 100% coursework.
Prerequisite: PSYC2101.

PSYC3054. Human neuropsychology (6 credits)

This course introduces basic principles of brain-behaviour relationships. Research methods for investigating brain-behavior relationships are reviewed. The neuro-anatomical and neuropsychological mechanisms underpinning various cognitive and affective processes as well as how these processes are dysregulated in some common brain disorders are discussed. Students will participate in an independent empirical research project. Priority will be given to UG students majoring in psychology and neuroscience.
Assessment: 100% coursework
Prerequisites: Either PSYC2101 or PSYC2022

PSYC3061. Advanced issues in perception (6 credits)

This advanced seminar course reviews findings from both recent and classical research on human perceptual systems. Modules will consider in-depth, select special topics such as cross-modal perceptual interactions, lessons from abnormal perception in agnosia, amblyopia, etc. Modules will be discussed from a multidisciplinary standpoint, integrating computational, psychophysical and neurobiological approaches. Priority will be given to UG students majoring in psychology and neuroscience.
Assessment: 100% coursework
Prerequisites: PSYC1004 and PSYC2051.

PSYC3068. Advanced cognitive psychology (6 credits)

This course covers some of the more recent developments in cognitive psychology. Students will learn about current issues in cognitive psychology by reading research articles. Topics may include consciousness, mental representations of objects/faces/letters, language, memory and decision making, as well as other topics reflecting the interests of the teacher. Students will each do an independent empirical research project. Priority will be given to UG students majoring in psychology.
Assessment: 100% coursework
Prerequisites: PSYC1004 and either PSYC2007 or PSYC2051.

PSYC4101. Thesis in neuroscience (12 credits)

(For neuroscience major) Students will each conduct an independent empirical research project. Regular attendance for research supervision is required. The project write-up should be about 6,000 to 10,000 words (exclusive of tables, bibliographies and appendices).
Assessment: 100% coursework
Prerequisites: PSYC1001 and PSYC1004 and PSYC2060 and PSYC2101

PSYC4102. Capstone project in neuroscience (6 credits)

This course comprises an independent research study in an area of neuroscience of the candidates' choice, subject to availability of supervision. Students will read within an area of study, to be agreed with their instructor, and write an extended essay or research proposal.
Assessment: 100% coursework
Prerequisite: PSYC2101

Course descriptions for Non-PSYC electives

BBMS3011. Molecular Neuroscience (6 credits)

This is an advanced course aiming to provide students with the latest frontier on molecular and cellular mechanisms that underlie the structure and function of the central nervous system. This interdisciplinary course covers fundamental concepts on the molecular basis of brain functions during development and aging, and discusses how dysregulation of these processes might lead to various brain disorders. Topics include axon guidance, synaptic transmission, formation and plasticity of synapses, learning and memory, and diseases of the nervous systems such as cognitive and emotional disturbance. Latest techniques in neuroscience research, such as the use of viral-mediated expression of transgenes, optogenetics, chemogenetics, and induced pluripotent stem cells, will be introduced. Lectures tutorials, presentation of research papers and research-oriented practical training are emphasized so as to expose students to different areas in molecular neuroscience through multiple learning activities.

Prerequisite: Pass in any one of the following courses:
BBMS1001 Introduction to Human Anatomy and Physiology
BIOL1110 From Molecules to Cells
BIOC2600 Basic Biochemistry
BIOL2220 Principles of Biochemistry
BMED2302/MEDE2302 Life Sciences II (Cell Biology & Physiology)
PSYC2101 Foundations of Neuroscience I
PSYC2110 Developmental Neuroscience

Assessment: 50% continuous assessment; 50% examination.

BBMS3012. Stem Cell Biotechnologies in Regenerative Medicine (6 credits)

Stem cell research and biotechnology has great promise for the future of regenerative medicine. The course covers the stem cell biology of various organ systems, particularly in the context of human diseases, the state-of-the-art biotechnologies for stem cell research, and their applications in disease modelling, treatment, and drug development. In addition, non-scientific aspects such as bioethics, political developments, future development, and challenges of stem cell research will also be discussed. Hands-on laboratory experience will be provided. Upon completion, students

should have a solid knowledge of stem cell biology and their implications in tissue homeostasis and diseases, as well as the latest biotechnologies for stem cell research and their applications.

Prerequisite: Pass any one of the following courses:
BIOC2600 Basic Biochemistry
BIOL2220 Fundamentals of Biochemistry
BIOL3401 Molecular Biology
BBMS2007 Essential Molecular Biology
BBMS3002 Molecular Biology of the Cell
BMED2301 Life Sciences I (Biochemistry)
Assessment: 50% continuous assessment; 50% examination

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BIOL3105. Animal physiology & environmental adaptation (6 credits)

The course covers the major aspects of animal physiology for environmental adaptation in terrestrial & aquatic habitats. Stress will be given to the functional interactions between animals and the environment, especially on the mechanisms by which animals obtain resources for survival from the environment, detect environmental changes via sensory structures, and respond to adversities in the environment by altering their body forms & functions.
Prerequisite: BIOL2103 or BIOL2220 or BIOC2600 or MEDE2301
Assessment: 50% continuous assessment; 50% examination.

BMED3501. Medical imaging (6 credits)

Medical imaging is an 10ndispensable technology in modern healthcare and biomedical research. It provides in vivo anatomical, physiological and functional information of the human body in normal, developing and pathological states. The rapid development in this field not only leads to better disease diagnosis and more accurate treatment efficacy assessment, but also paves the way for better understanding of living biological systems.

This course presents the mathematical, physical, and computational principles underlying modern medical imaging systems. It will cover fundamentals of conventional (X-ray and Ultrasound) and modern (Computerized Tomography – CT; Magnetic Resonance Imaging – MRI; Nuclear Imaging and Optical Imaging) imaging techniques applied to biological systems and in medical diagnoses and the interpretations of these images. Techniques for the visualization, segmentation, and analysis of medical image data will also be discussed, as well as applications of medical imaging.

At the end of the course, students should gain a clear understanding in the physics, working principles and mathematics involved in the various imaging modalities covered. They should also be able to appreciate the interdisciplinary nature of the subject and learn the latest development or advancement in the field of medical imaging.

Pre-requisite: Pass in BMED2500 or ELEC3241

Assessment: 30% continuous assessment 70% examination

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