

Master of Research Neuroscience

Programme Requirements

Neuroscience - MRes

30 credits from Module List:PN5000-PN5001 **and**
 30 credits from Module List: PN3313, PN4230-PN4231, PN4234-PN4235, PS4065, PS4071, PS4079, PS4089, PS4091, PS4096-PS4097, BL4232, BL4224, BL4274, BL4280, BL4282, BL5420 **and**
 PN5099 (120 credits)
 Additional PS-, PN- and BL-coded modules may be taken with approval of the programme coordinator and relevant module coordinator

Compulsory modules:

PN5000 Neuroscience Research Design Reading Party

SCOTCAT Credits:	10	SCQF Level 11	Semester:	Summer
Availability restrictions:	Available only to students on MRes in Neuroscience.			
Planned timetable:	n/a			
<p>An introductory week-long module designed to provide an intensive introduction to designing and carrying out neuroscience research at the postgraduate level. Throughout the module, students will have opportunities learn transferable career skills that revolve around the process of proposing and evaluating scientific research. Students will critically analyse current primary literature in neuroscience and the methodology and ethical issues underlying research proposals. Students will self-direct their own learning and work in groups to formulate research proposals which they then orally present. In response to feedback, students finally submit a written assessment that critically evaluates published primary literature or grant proposals.</p>				
Programme module type:	Compulsory for Neuroscience MRes			
Co-requisite(s):	PN5001 and PN5099			
Learning and teaching methods and delivery:	Weekly contact: 20 hours of lectures and 20 hours of tutorials during 1 week in summer vacation 2 weeks before preessional week			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr S Pulver			
Module teaching staff:	Team taught			

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PN5001 Techniques and Skills in Neuroscience Research				
SCOTCAT Credits:	20	SCQF Level 11	Semester:	1
Planned timetable:	n/a			
<p>This seminar-based module offers a theoretical perspective on state-of-the-art neuroscience techniques through critical analysis of primary literature. It also provides opportunities to learn transferrable career skills that are of importance to neuroscientists irrespective of any one area of research. Weekly seminars will involve presentations by students and /or staff that cover neurophysiological, neuropharmacological and neurogenetic approaches to understanding neural function. Seminars will also provide a framework for discussing general career skills such as grant writing, gaining ethical approval for research, using technology to enhance communication, and social networking within scientific communities. Learning will be largely self-directed with students delving into research areas and career paths that they wish to pursue. Assessment will be based on oral presentations which synthesize and critique recent advances in neuroscience.</p>				
Programme module type:	Compulsory for Neuroscience MRes			
Co-requisite(s):	PN5000 and PN5099			
Learning and teaching methods and delivery:	Weekly contact: 1.5-hour seminars (x 11 weeks)			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr S Pulver			
Module teaching staff:	Team taught			

PN5099 Masters Thesis Research in Neuroscience				
SCOTCAT Credits:	120	SCQF Level 11	Semester:	Whole Year
Planned timetable:	n/a			
<p>The student will carry out a major piece of original and independent research under the supervision of an academic advisor. Supervision will be regular but will vary depending on the nature of the research project and the skill set of individual students. Under normal circumstances, research will be carried out during both semesters and during the summer. The aim of the module is to give students an opportunity to design, conduct and analyze neuroscience research and then learn how to present such work in writing. Assessment will be in the form of an oral presentation at the beginning of semester 2 and in the form of a written thesis submitted by the stated date in August.</p>				
Programme module type:	Compulsory for Neuroscience MRes			
Learning and teaching methods and delivery:	Weekly contact: 1 hour (x 40 weeks)			
Assessment pattern:	30-minute Oral Examination = 25%, Dissertation = 75%			
Module coordinator:	Dr S Pulver			
Module teaching staff:	various			

Optional modules:

PN3313 Neuroscience				
SCOTCAT Credits:	20	SCQF Level 10	Semester:	1
Planned timetable:	Lectures: 12.00 am Mon, Tue and Wed Practicals: to be arranged.			
<p>This module covers biochemical, cellular and behavioural aspects of the nervous system in health and disease. It starts with the basic biochemistry of neural membrane proteins such as receptors and channels, and considers the cellular mechanisms of action potential generation and propagation, and synaptic transmission. The physiology of sensory perception is illustrated by examining the visual system, while motor control is considered in terms of vertebrate locomotion. Selected aspects of learning and memory processes are also examined. Students are given extensive hands-on experience of computer simulation as a learning tool in this course. The associated practical work illustrates the lecture course through experiments on the nerve impulse, and mechanisms of neuronal cell loss.</p>				
Programme module type:	Optional for MRes in Neuroscience, with approval of Programme Coordinator			
Learning and teaching methods and delivery:	Weekly contact: 29 hours of lectures or tutorials in total, 3 x 3-hour practicals and 4 hours of labs during the semester.			
Assessment pattern:	3-hour Written Examination = 60%, Coursework = 40%			
Module coordinator:	Dr G Miles			
Module teaching staff:	Prof F Gunn-Moore, Prof K Sillar, Dr S Pulver, Dr G Miles, Dr W Heitler, Dr W Li, Dr G Doherty			

PN4230 Neurodegeneration and Aging				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Availability restrictions:	BSc Hons Neuroscience students have priority on this module			
Planned timetable:	Seminars: 3.00 pm - 4.00 Mon, 1.00 pm - 2.00 pm Thu (weeks 1-5); Seminars: 12.00 pm - 2.00 pm Thu (weeks 7 and 9-11); Labs: 2.00 pm - 5.00 pm Tues, Wed (week 8)			
<p>In this module, students will develop a detailed understanding of molecular neuroscience. Work will focus at the biochemical and molecular level, so that detailed knowledge of signalling pathways will be gained. The module concentrates on three key areas relating to neurodegenerative processes. 1) How neurons stay alive 2) The aging nervous system: Changes that can 'prime' neurons for degeneration, degenerative disorders - risks, pathology, treatments. Including a practical session 3) How the nervous system responds to neurodegenerative diseases, with particular focus on Alzheimer's disease.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: Seminars: up to 2 hours per week (to a total of 18 hours) and 2 x 3-hour practicals during the semester.			
Assessment pattern:	2-hour Written Examination = 66%, Coursework = 34%			
Module coordinator:	Dr G Doherty			
Module teaching staff:	Prof F Gunn-Moore, Dr G Doherty, Dr M Andrews			

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PN4231 Neuromodulation				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Availability restrictions:	BSc Hons Neuroscience students have priority on this module			
Planned timetable:	Lectures: 11.00 am - 12.00 noon Tue and 10.00 am - 11.00 am Fri. Practicals to be arranged.			
<p>Until recently the nervous system was viewed as a black and white world in which neuronal networks carried out tasks using fast chemical synaptic transmission to produce an appropriate network output. However the output of neuronal networks is not fixed but instead is modifiable under different behavioural or developmental circumstances. A major source of flexibility in the output neuronal networks derives from neuromodulation; a process in which the basic operation of the networks remains the same but the strengths of synaptic connections and the integrative electrical properties of neurons in the networks are changed by the actions of a range of neuromodulators. This module explores the diverse range of neuromodulatory mechanisms and outlines their importance in information processing in the nervous system.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 2 seminars.			
Assessment pattern:	1.5-hour Written Examination = 50%, Coursework = 50%			
Module coordinator:	Dr S Pulver			
Module teaching staff:	Dr S Pulver, Prof K Sillar, Dr G Miles, Dr W Li, Dr W Heitler			

PN4234 Synaptic Transmission				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Availability restrictions:	BSc Hons Neuroscience students have priority on this module			
Planned timetable:	Lectures: 11.00 am -12:30 pm Wed and 12.00 noon -1.00 pm Fri. Practicals to be arranged.			
<p>Extensive and versatile communication between nerve cells using special junctions called synapses endows the nervous system with many complex functions like learning and memory. This module will cover important recent progress in understanding the morphology and ultrastructure of synapses, neurotransmitter corelease and recycling mechanisms, retrograde signalling, synaptic plasticity, the role of glial cells and the development of neurotransmission. Some laboratory work will provide students with hands-on experience of advanced research methods.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: A total of 6 x 1.5 hour seminars, 7 x 1 hour lectures and 2 x 3 hour practicals over 10 weeks			
Assessment pattern:	2-hour Written Examination = 60%, Coursework = 40%			
Module coordinator:	Dr W Li			
Module teaching staff:	Dr W Li, Dr S Pulver, Dr G Miles			

PN4235 Motoneurons: From Physiology to Pathology				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Availability restrictions:	BSc Hons Neuroscience students have priority on this module			
Planned timetable:	Lectures : 2.00 pm - 3.00 pm Mon and 9.00 am - 10.30 am Fri. Practicals to be arranged.			
This module aims to provide in depth knowledge of key aspects of neuronal function and potential dysfunction by focussing on one of the most studied and best characterised classes of neurons in the central nervous system, motoneurons. The module will cover topics such as: the history of motoneurons in neuroscience research; the genetics controlling motoneuron development, the intrinsic electrical properties of motoneurons; synaptic inputs received by motoneurons; motoneuron recruitment; and motoneuron disease.				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 10 hours of seminars, 6 hours of lectures and 6 hours of practical over the semester.			
Assessment pattern:	2-hour Written Examination = 60%, Coursework = 40%			
Module coordinator:	Dr G Miles			
Module teaching staff:	Dr W Li, Prof K Sillar, Dr G Miles, Dr W Heitler			

PS4071 Behavioural Neuroscience				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	11.00 am - 1.00 pm Thu			
The overall aim of this module is to allow students access to current research in the area of behavioural neuroscience. Possible topics include motivation, learning and attention. Past themes explored in the module include: the relationship between 'normal' learning and addiction; the transition from goal-directed action to stimulus-response habit; the neural basis of compulsive gambling; the efficacy of biological treatments of addiction; and the behavioural and neural effects of MDMA ('ecstasy'). Results from both human and animal research will be considered in parallel, with examples of papers ranging from molecular neuroscience to neuropsychology. The format of the module will include lectures (which are designed to provide the students with the background necessary to read research articles); guided seminars and student presentations summarising research articles. In order to maximise the benefits of the students' presentations, each student will meet with the lecturer at least twice to discuss the topic and content of their talk.				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 2-hour seminars plus office hour.			
Assessment pattern:	2-hour Written Examination = 75%, Coursework = 25%			
Module coordinator:	Dr E M Bowman			

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PS4079 Sex Differences and Gender Development				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Planned timetable:	11.00 am - 1.00 pm Fri			
<p>This advanced-level module will examine the evidence for sex differences in human behaviour and explore how gender develops across the lifespan. Students will learn how hormones, such as testosterone and estrogen, influence brain function and behaviour in non-human animals and will apply this knowledge to human data. Example topics include sexual behaviour (including sexual orientation), aggression, memory, sex differences in mental health, and the evolution of sex differences. Teaching will be based on student-led seminars with supporting lectures. Emphasis will be placed on critical evaluation and the ability to relate scientific data to broader debates regarding sex differences in behaviour.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 2-hour seminars plus office hour.			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr G Brown			

PS4089 Neural Basis of Episodic Memory				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	11.00 am - 1.00 pm Tue			
<p>This module will examine how the brain enables us to remember information from our personal experience. It will present students with cutting edge research using both humans and animals that gives us an insight into how the psychological components of episodic memory can be represented and processed by the brain. We will go on to look at how this type of research is applied in fields such as future thinking and memory decline in dementia. The course will include lectures and student presentations based around current research articles in the field.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 2-hour seminars plus office hour.			
Assessment pattern:	Written Take Home Examination = 75%, Coursework = 25%			
Module coordinator:	Dr J A Ainge			

PS4091 Computer-aided Research				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	9.00 am - 11.00 am Tue			
<p>As research becomes ever more computationally intense, the ability to use modern research software is becoming indispensable. This practical module will offer an introduction to computational modelling and provide you with the skills necessary to apply it in your research. Emphasis will be put on using scientific scripting languages in a research context. This module will build on the statistical techniques learned in previous modules and introduce modelling techniques, and imaging, stimulus presentation, and data visualisation.</p>				
Programme module type:	Optional for Research Methods in Psychology (MSc), Optional for Neuroscience (MSc)			
Learning and teaching methods and delivery:	Weekly contact: 1 lecture and 1 seminar plus office hour.			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr T Otto			

PS4096 Mechanisms of Behaviour: integrating psychological and neuroscience perspectives				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Planned timetable:	12.00 noon - 2.00 pm Tue			
<p>The aim of this module is to explore some of the many physiological and neural systems that modulate patterns of behaviour in a range of species, including humans. It will highlight the importance of integrating information from psychology and neuroscience disciplines in order to further our understanding of how and why animals and humans behave the way they do in different situations. The module will deal with examples of mechanisms across different levels of complexity (from genes to physiology). The module will include lectures and student presentations/journal club discussions based around current research articles in the field and a practical session with hands on experience of a physiological technique.</p>				
Programme module type:	Optional for MSc Evolutionary and Comparative Psychology: the Origins of Mind. Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 2-hour lecture (x 10 weeks), 1 practical class (x 4 weeks) plus office hour.			
Assessment pattern:	Coursework (including presentation) = 100%			
Module coordinator:	Dr K Spencer			
PS4097 Research Methods in Cognitive Neuroscience				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Planned timetable:	9.00 am - 11.00 am Tue			
<p>Tremendous progress in technology allows now to observe the brain in action to understand the physical bases of behaviour. This module showcases this state of the art approach.</p> <p>Guided by a team of lecturers with first-hand expertise in trans cranial magnetic stimulation, neurophysiology, electrophysiology, behavioural modelling, neuropsychology and functional magnetic resonance imaging the students will develop their ability to evaluate and propose cutting edge research. The course includes lectures and student led discussions of current research topics.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 lecture, 1 seminar plus office hour.			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr D Balslev			
Module teaching staff:	Dr D Balslev, Dr T Otto, Dr J Ales, Dr G Miles			

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BL4232 Neuroethology				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	To be arranged.			
<p>Neuroethology is the study of the neural control of natural animal behaviour from a comparative biological perspective. In this module we focus mainly on behaviours arising from the interactions between predators and their prey. Predators and prey are locked in an evolutionary arms race which continuously refines and improves the abilities of predators to locate and capture prey, and of prey to detect and evade predators. This strong selective pressure has produced some spectacular adaptations in both the nervous systems and the overall anatomy of the animals concerned. This, combined with the usually unambiguous motivation of the animals involved in predator-prey interactions (eat or starve, escape or be eaten) has made such adaptations favoured targets for study by neuroscientists, behavioural scientists, and biomechanicists. Students on this module will undertake a series of guided case studies researching the primary literature, and the module will also include some hands-on laboratory work. The aim is both to uncover some general principles of neural and biomechanical organisation, and also to reveal the variety and ingenuity with which evolution has found different solutions to shared problems.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 x 2-hour seminar (x 10 weeks)			
Assessment pattern:	2-hour Written Examination = 50%, Coursework = 50%			
Module coordinator:	Dr W J Heitler			
Module teaching staff:	Dr W Heitler, Prof K Sillar			

BL4274 Evolutionary Developmental Biology				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	To be arranged.			
<p>Evolution of new morphologies involves changes to the development of organisms. The field of evolutionary developmental biology is thus becoming established as a major and essential component of any comprehensive understanding of evolutionary biology. This module aims to cover some of the main, current themes in evolutionary developmental biology. Since animal life evolved in the sea, much of what we can learn about the major events in animal evolution can be obtained from studying marine invertebrates. Consequently the examples covered in this module will tend to be drawn from these organisms.</p>				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 x 2-hour seminar (x 10 weeks).			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr D Ferrier			
Module teaching staff:	Dr D Ferrier, Dr I Somorjai			

BL4280 Evolution and Human Behaviour				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	1
Planned timetable:	To be arranged.			
Evolutionary biologists, anthropologists and psychologists have taken evolutionary principles and used them to explain a range of human characteristics, such as homicide, religion and sex differences in behaviour. Other researchers are sceptical of these interpretations, and critical of the methods. Moreover, researchers disagree as to the best ways to use evolution to explore humanity, and a number of schools of thought have emerged. This module will introduce and critically evaluate the main evolutionary approaches currently being used, including socio-biology, evolutionary psychology, behavioural ecology and gene-culture co-evolution.				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 x 2-hour seminar (x 10 weeks).			
Assessment pattern:	1.5-hour Written Examination = 40%, Coursework = 60%			
Module coordinator:	Dr M Webster			
Module teaching staff:	Dr M Webster. Dr K Cross, Dr L Dean, Dr C Evans, Dr A Navarrete			

BL4282 Biology and Behaviour of Social Insects				
SCOTCAT Credits:	15	SCQF Level 10	Semester:	2
Planned timetable:	To be arranged.			
This module will examine and compare the biology of the four main groups of social insects: termites, ants, wasps and bees. Sociality in other groups (aphids, beetles) will also be considered briefly. Topics will include the evolution of sociality, social organisation and social control systems, reproductive strategies, and diverse communication modes including pheromonal systems, acoustic systems, and 'bee dances'. Aspects of foraging behaviour and learning abilities will also be considered, particularly for ants (leaf cutter ants, army ants, slave-making ants) and for bees both eusocial and semi-social. There will be strong evolutionary, ecological and behavioural themes, and relevance also to conservation issues.				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 x 3-hour seminar (x 11 weeks).			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Prof P Willmer			
Module teaching staff:	Prof P Willmer, Dr A Gardner, Dr G Ballantyne			

BL5420 Advanced Microscopy and Image Analysis - Seeing is Believing				
SCOTCAT Credits:	15	SCQF Level 11	Semester:	1
Planned timetable:	To be arranged.			
This module will introduce you to advanced imaging techniques, such as Confocal, Super-resolution, TIRF and Electron Microscopy and how these techniques have been utilised to address fundamental questions in Cell and Developmental Biology. You will get the opportunity to research techniques that are at the forefront of modern Biology and to develop skills in ImageJ analysis of imaging data, a skill that will be central to the advancement of bioscience in the coming years. Activities will be supplemented with research talks from academics at the cutting edge of their field and the opportunity to see advanced imaging techniques in practice.				
Programme module type:	Optional for MRes in Neuroscience			
Learning and teaching methods and delivery:	Weekly contact: 1 x 2-hour seminar (x 9 weeks) and 2 x 2-hour seminar (x 1 week)			
Assessment pattern:	1.5-hour Written Examination = 20%, Coursework = 80%			
Module coordinator:	Dr M Bischoff			
Module teaching staff:	Team taught			

