

LF262-15 Neurobiology

21/22

Department

Life Sciences

Level

Undergraduate Level 2

Module leader

Yuriy Pankratov

Credit value

15

Module duration

5 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

The aim of this module is to introduce students to one of the fundamental processes that underpin modern biomedical science: immunology. It builds on the material delivered in BS127 Agents of infectious disease and provides the preliminary understanding for the final year module BS317 Advanced Immunology. Together with companion modules dealing with specific pathogens, the module considers many disease processes and their mitigation.

Module aims

The module aims to give an overview of the field of Neurobiology. It includes an introduction to the physiology of the nervous system, and reflects the expertise of the Department with a more detailed analysis of the cell and molecular biology underlying our present understanding of the way in which the nervous system develops and functions. The module stands on its own as one bridging the gap between Molecular Biology and the functioning of whole organisms.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Lectures 1-5

Neuronal Development, Cell biology and Disease

The aim of this part of the module is to provide an understanding of basic principles of organization of a nervous system and development of the nervous system. It will also give us an opportunity to discuss some diseases.

Neuronal cell biology: specialities of neuronal cell biology – axonal transport, localised translational control of mRNA, inter-cellular mRNA exchange by nanotubes, myelination.

Diseases caused by defects in these systems.

Axon guidance: the identification of the factors involved in wiring a nervous system , including axonal growth cone structure, attraction and repulsion, pioneer and follower neurons.

Synaptic refinement and activity dependence: the Chemospecificity hypothesis, the role of activity in synaptic refinement and its molecular basis.

Development of the CNS: the link between genes and function of neuronal cells with particular focus to the development of nervous system

Lectures 6-10

Fundamentals of Neurophysiology

These lectures will explore fundamental principles of signal transmission in the nervous system, including electrical signalling in the neurons and the role of various neurotransmitters and their receptors in the information processing in the brain. The brief overview of the most important neuro physiological experimental techniques will be given. Lecture topics include:

Basic electrophysiology: role for ion channels in the signalling in neurons other cells and techniques which are used to study them: patch-clamp, current clamp, voltage clamp, fluorescent imaging. Synaptic transmission and neurotransmitter receptors - basic classes of neurotransmitters
An appreciation of our knowledge at the cellular and molecular level of highly complex interactive processes

An understanding of how a reductionist approach can yield valuable insight into events affecting the whole organism and their receptors; release and turnover of neurotransmitters and their modes of action.

Integration in the CNS - how neural networks process information.

Lectures 11-15

Functional Properties of Neuronal Networks

The final part of the module aims to provide an understanding of the functional properties of neuronal circuits and explore the role of neuronal networks in physiological processes including respiration, sleep and memory. The lectures will cover the following topics:

Central Pattern Generators;

Neural Circuits;

Respiration;

Sleep;

Plasticity/modulation.

Learning outcomes

By the end of the module, students should be able to:

- Level 5 understanding of the structure and functioning of the Central Nervous system
- Level 5 understanding of how neural networks process information and the techniques used

to study such processes.

- Level 5 understanding of the development and formation of the CNS at a molecular level
- Level 5 understanding of the role of the nervous system in other physiological functions in the organism

Indicative reading list

Bear et al Neuroscience – Exploring the Brain 2001

Delcomyn H Foundations of Neurobiology 1998

Students are directed to the current literature for an up-to-date appreciation of developments in this area

Subject specific skills

Understand the structure and functioning of the Central Nervous system.

Understand how neural networks process information and the techniques used to study such processes.

Understand the development and formation of the CNS at a molecular level.

Understand the role of the nervous system in other physiological functions in the organism.

Transferable skills

Self directed learning

Adult learning

Critical appraisal of source material

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Practical classes	1 session of 1 hour (1%)
Other activity	10 hours (7%)
Private study	124 hours (83%)
Total	150 hours

Private study description

Self directed learning and revision for final exam

Other activity description

Authentic assessment, based on a common problem or dataset researchers would deal with on a regular basis in the academic environment. This is in-line with both AQSC and RSB requirements on assessments

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group D

	Weighting	Study time
In Module Assessment	30%	30 hours
Authentic assessment, based on a common problem or dataset researchers would deal with on a regular basis in the academic environment. This is in-line with both AQSC and RSB requirements on assessments		
Online Examination	70%	45 hours
45 min SAQ Exam paper / 45 min Essay paper		

- Online examination: No Answerbook required

Assessment group R

	Weighting	Study time
Exam (Capped)	100%	
45 min SAQ Exam paper / 45 min Essay paper		

- Answerbook Green (8 page)

Feedback on assessment

Final examination feedback is given to returning students as generalised feedback on what constituted a good essay; common mistakes/misconceptions and good practise are identified and shared.

Availability

Courses

This module is Core for:

- Year 2 of UIPA-C1L8 Undergraduate Life Sciences and Global Sustainable Development
- Year 2 of ULFA-B140 Undergraduate Neuroscience (BSc)
- Year 2 of ULFA-B142 Undergraduate Neuroscience (MBio)
- Year 2 of ULFA-B143 Undergraduate Neuroscience (with Industrial Placement) (MBio)
- Year 2 of ULFA-B141 Undergraduate Neuroscience (with Placement Year) (BSc)

This module is Core optional for:

- Year 2 of UIPA-C1L8 Undergraduate Life Sciences and Global Sustainable Development

This module is Optional for:

- Year 2 of UBSA-C700 Undergraduate Biochemistry
- Year 2 of ULFA-C1A2 Undergraduate Biochemistry (MBio)
- Year 2 of ULFA-C702 Undergraduate Biochemistry (with Placement Year)
- Year 2 of ULFA-C1A6 Undergraduate Biochemistry with Industrial Placement (MBio)
- Year 2 of UBSA-3 Undergraduate Biological Sciences
- Year 2 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- Year 2 of ULFA-C113 Undergraduate Biological Sciences (with Placement Year)
- Year 2 of ULFA-C1A5 Undergraduate Biological Sciences with Industrial Placement (MBio)
- Year 2 of UBSA-C1B9 Undergraduate Biomedical Science
- Year 2 of ULFA-C1A3 Undergraduate Biomedical Science (MBio)
- Year 2 of ULFA-C1A7 Undergraduate Biomedical Science with Industrial Placement (MBio)
- Year 2 of ULFA-CB18 Undergraduate Biomedical Science with Placement Year
- Year 2 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)