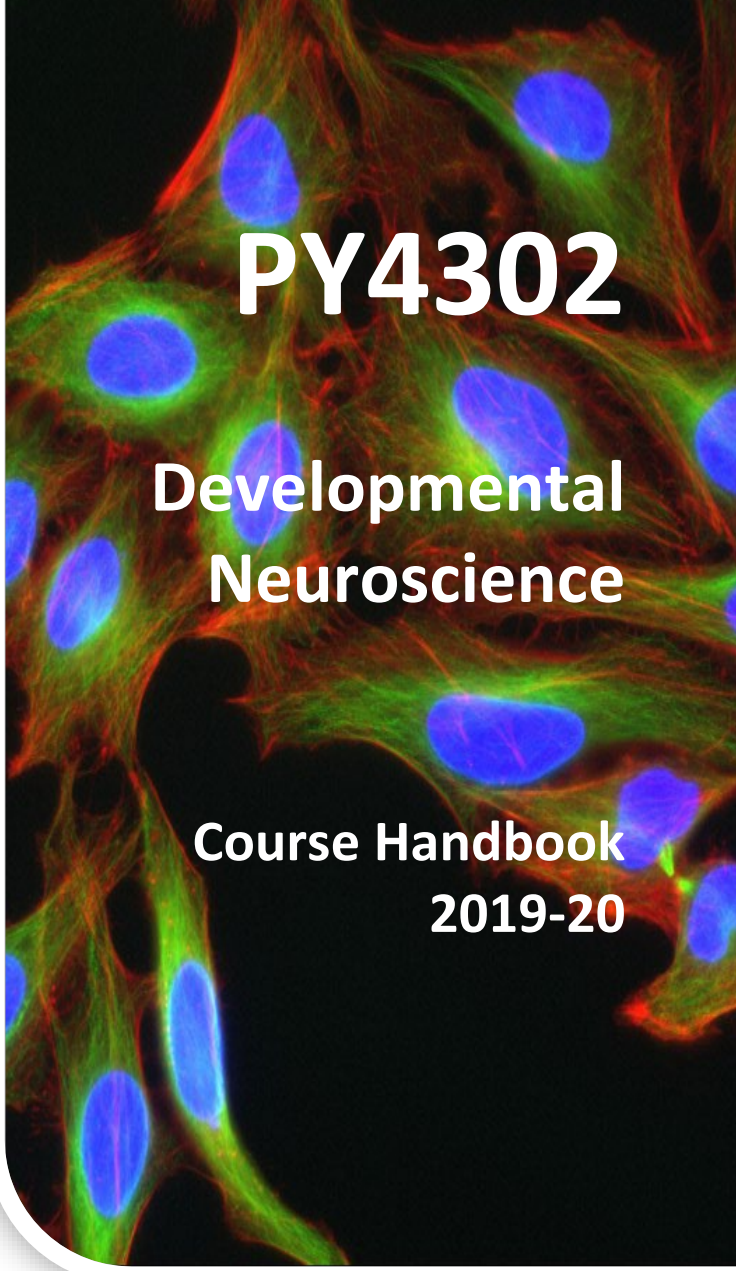
School Of Medicine, Medical Sciences & Nutrition



PY4302

Developmental Neuroscience

Course Handbook
2019-20

UNIVERSITY OF ABERDEEN

Contents

Cover image:

Confocal micrograph of fluorescently labelled HeLa cells.

Nuclei are labelled in blue, tubulin in green and actin fibres in red.

Courtesy of:

Kevin Mackenzie
Microscopy and Histology Core Facility
Institute of Medical Sciences
University of Aberdeen
http://www.abdn.ac.uk/ims/microscopy-histology

Course Summary

This course considers the development of the nervous system and examples of functional networks. Areas discussed: 1) The initial establishment of the nervous system in the embryo and subsequent neuron growth. 2) Development of the eye and functional eye-brain networks. 3) Synaptogenesis, development of the neuromuscular junction and pain pathways. Topics incorporate aspects of stem cell function, nerve and muscle function and examples of disease states. The course consists of 4 lectures per week and is examined by continuous assessment of a group presentation topic (group and individual elements), a course essay and a 2-hour written exam.

Course Aims & Learning Outcomes

To use the basics of central and peripheral nervous system function covered in Years 2 and 3, to consider how these systems become established from undifferentiated cells. Students will learn how nerves grow, how they move, how they transport materials over long distances, how nerves communicate, what signals regulate these activities and how the nervous system generates specific functions (e.g., vision, muscle contraction, pain).

Course Teaching Staff

Course Co-ordinator(s):

Course Organiser: Dr Ann M. Rajnicek (ext (43)7514) **a.m.rajnicek@abdn.ac.uk**

Other Staff:

Dr Guy S Bewick (GSB)

Prof Martin Collinson (MC)

Prof Lynda Erskine (LE)

Dr Wenlong Huang (WH)

Prof Stephen N Davies (SND)

Prof Colin D McCaig (CDM)

Dr Giuseppe D'agostino (GD)

Assessments & Examinations

Course Essay – 15%

Guidance for the layout, content and assessment of the essay will be given during the course. It should be 2000-3000 words in length. Submission date: as indicated in the course timetable.

Overall Course Assessment

a). Continuous assessment - 15% of the course total will be based on the essay

b). Group Presentation – 15% of the total course assessment. See MyAberdeen for details.

- 2.5% Peer assessment of your participation
- 2.5% Mark for group's presentation
- 10% Individual written summary (limit-500 words)

c). Examination 70% of the assessment for PY4302 DEVELOPMENTAL NEUROSCIENCE. This will take place in the summer diet, April/May. It will take the form of an essay-based examination. It is likely to be a 2-hour exam in which 2 essays are attempted from a choice of at least 6. All assessments (continuous and examined) will be made using the University Common Grading Scale (copy attached).

Class Representatives

We value students' opinions in regard to enhancing the quality of teaching and its delivery; therefore, in conjunction with the Students' Association we support the Class Representative system.

In the School of Medicine, Medical Sciences & Nutrition we operate a system of course representatives, who are elected from within each course. Any student registered within a course that wishes to represent a given group of students can stand for election as a class representative. You will be informed when the elections for class representative will take place.

What will it involve?

It will involve speaking to your fellow students about the course you represent. This can include any comments that they may have. You will attend a Staff-Student Liaison Committee and you should represent the views and concerns of the students within this meeting. As a representative you will also be able to contribute to the agenda. You will then feedback to the students after this meeting with any actions that are being taken.

Training

Training for class representatives will be run by the Students Association. Training will take place within each half-session. For more information about the Class representative system visit **www.ausa.org.uk** or email the VP Education & Employability **vped@abdn.ac.uk**. Class

representatives are also eligible to undertake the STAR (Students Taking Active Roles) Award with further information about this co-curricular award being available at: **www.abdn.ac.uk/careers**.

Problems with Coursework

If students have difficulties with any part of the course that they cannot cope with alone they should notify the course coordinator immediately. If the problem relates to the subject matter general advice would be to contact the member of staff who is teaching that part of the course. Students with registered disabilities should contact Mrs Jenna Reynolds (**medsci@abdn.ac.uk**) in the Medical Sciences Office (based in the Polwarth Building, Foresterhill), or Mrs Sheila Jones (**s.jones@abdn.ac.uk**) in the Old Aberdeen office associated with the teaching laboratories, to ensure that the appropriate facilities have been made available. Otherwise, you are strongly encouraged to contact any of the following as you see appropriate:

- Course student representatives
- Course co-ordinator
- Convenor of the Medical Sciences Staff/Student Liaison Committee (Prof Gordon McEwan)
- Personal Tutor
- Medical Sciences Disabilities Co-ordinator (Dr Derryck Shewan)

All staff are based at Foresterhill and we strongly encourage the use of email or telephone the Medical Sciences Office. You may have a wasted journey travelling to Foresterhill only to find staff unavailable.

If a course has been completed and students are no longer on campus (i.e. work from second semester during the summer vacation), coursework will be kept until the end of Fresher's Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

Course Reading List

Reading lists for lecture content are incorporated in lecture slides on MyAberdeen.

Lecture Synopsis

PART 1: BUILDING THE CNS

Lectures 1 & 2: Nervous system induction – Dr Ann Rajnicek

The earliest stages of nervous system formation will be discussed. The lectures describe experimental evidence that the nervous system arises by a series of induction events and identify roles for specific inducing signals incorporating the experimental evidence.

Lecture 3: Neurogenesis/migration - Prof C.D. McCaig

Nerve cells are born in sites distant from those that they finally occupy. The locations and controls of neuronal differentiation will be considered together with the mechanisms controlling neuronal migration. The consequences of disrupting normal migration of neurones are also considered.

Lecture 4: Neuronal motility and axonal transport - Prof C.D. McCaig

How new born neurons move to correct positions in the developing nervous system. How nerves transport materials intracellularly, axonal transport, the microstructure and function of the neuronal cytoskeleton. The postulated mechanisms controlling these events will be outlined.

Lecture 5: Electrical guidance cues - Dr Ann Rajnicek

The nervous system develops within a natural electric field generated by embryonic epithelia and the neural tube itself. The effects this has on neuronal cell behaviour, the underlying mechanisms and how it can be useful clinically will be discussed.

Lecture 6: Neurotrophic factors - Prof C.D. McCaig

Nerve growth factor and the other members of the neurotrophin family of secreted proteins will be discussed. Their mechanism of action, functional significance, and their roles in neuronal survival, development and regeneration will be considered.

PART 2: LINKING ANATOMY, DEVELOPMENT AND PHYSIOLOGY TO FUNCTION

Lecture 7: Retina development - Prof L. Erskine

This lecture investigates how the retina (a specialized outpost of the forebrain) develops from a single sheet of uniform precursors into a complex 3-dimensional arrangement of differentiated, specialized neurons and glia, ready to transmit information to the visual centres of the brain.

Lecture 8: Wiring the eye to the brain - Prof L. Erskine

Visual information is transmitted from the eye to the brain via the axon of retinal ganglion cells. The cellular and molecular mechanisms controlling the formation of these connections will be discussed.

Lecture 9: Exocytosis: the basis of quantal neurotransmitter release - Dr G.S. Bewick

The process of exocytosis as the underlying mechanism of quantal transmitter release at synapses will be discussed, with particular reference to the NMJ. The lecture will also cover recent work, both on the NMJ and on other preparations, concerning the proteins and ion channels involved in exocytosis and their position within the nerve terminal.

Lecture 10: Endocytosis and vesicle recycling - Dr G.S. Bewick

Membrane lost from the vesicle pool during exocytosis is thought to be recaptured via endocytosis then repackaged with neurotransmitter, ready for re-release. This lecture will describe our current state of knowledge of these processes, including recent studies of vesicle recycling kinetics using tracers and the molecules involved in this process.

Lecture 11: Modulation of transmitter release - Dr G.S. Bewick

Neurotransmitter release can be modulated by a variety of factors. The effect of activity and naturally occurring modulators will be examined, together with the underlying presynaptic changes thought to bring these about.

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Lecture 13: Developing pain - Dr Wenlong Huang

Pain results from the detection of intense or noxious stimuli by specialized sensory neurons (nociceptors), a transfer of action potentials to the spinal cord and onward transmission of the warning signal to the brain. In this lecture, students will learn the development of these sensory neurons in mammals and how they function in pain processing.

Practical/Lab/Tutorial Work

Group Work

Note: This work is examinable as it is intended to reinforce concepts learned elsewhere in the course. As for standard lectures, the presentations will be made available for revision purposes on MyAberdeen.

During the first week the class will be divided into groups to research a topic and each group will make one 20-minute presentation with up to 10 minutes of further peer-led questions/discussion (SEE TIMETABLE). This exercise aims to promote confidence and self-directed research, so students are expected not to require direct participation by staff. However, a Tutor has been assigned to each group in case there are issues that cannot be resolved within the group or for help understanding key concepts.

Marked elements:

- The **GROUP PRESENTATIONS** contribute **2.5%** to your course mark. This mark will be an audience assessment (including staff) and will be awarded to the group as a whole.
- Each student will assess the contribution made by each *other* member of their group, and this **PEER ASSESSMENT** will contribute a further **2.5%**. This incorporates attendance (at group meetings/practice sessions and the final presentation) as well as co-operation and successful completion of tasks agreed within the group.
- *Each student* is required to prepare a **WRITTEN SUMMARY** of *their Group topic* (see MyAberdeen for details) (SEE TIMETBLE FOR DEADLINE). The written 500-word summary contributes **10%** of your course mark.

Therefore, the group presentation aspect contributes 15% toward the final mark (2.5% peer assessment + 2.5% actual presentation + 10% for individual summary).

A list of Presentation Topics, Starter References, and guidelines will be made available on MyAberdeen.

Group meetings. The first Group meeting is timetabled in the 1st week of the course. At the first meeting each group should divide itself into subgroups, each taking responsibility for researching one aspect of the topic. Decide amongst yourselves how the presentation will be made and who will cover each part. You will have to work together and discuss each other's findings. A successful presentation should make a coherent story without repetition/overlap in the presentation as a whole. Groups are encouraged to meet as often as is agreed. Groups presenting on the same day are presenting related topics, so you are encouraged to discuss potential overlap with the other group to avoid excessive repetition.

Written summary:

Contributes 10% toward your continuous assessment

- To be prepared as an individual but incorporating information from other group members. Share information and work cooperatively at the early stages.
- Think Abstract- snappy and to the point. No waffle, no bullet points.

- It should represent the content of the *entire* group topic, not just the part you were assigned to research.
- **Strict** 500-word limit- include the word count at the end of the summary paragraph
- Figures are permitted, but they must be referred to in the text and each needs a brief figure legend. This will eat into your word count. So, use them very carefully.
- Include key references in the same way as if you were writing a *very* short essay. The reference citations in the text and the reference list are *not included in the word* count. But they should be very few, identifying that you can identify the key references. These may include relevant papers not in the original starter references provided.

Treat these topics as you would other lecture material. Students in non-presenting groups will be expected to contribute by asking questions after the presentation. Attendance will be taken.

Course Essay (15% of final mark)

You are required to write one essay during the course, which **will contribute 15% towards your final mark**. Use the references given as starter material and follow up references in these papers to develop your essay. Choose **one** essay title from those available on MyAberdeen.

Essay guidelines

- 2000-3000 words. Include a word count on the title page
- The essay should be submitted via MyAberdeen (see timetable for deadline).
- Use subheadings to organise main points.
- Use figures and images to get your point across. Don't waste time redrawing a published figure/image but make sure to cite the original source (includes web) in the figure legend.
- All figures require a brief legend, and all must be referred to in the body of the essay.
- The last page of your essay should be a list of references cited and these should all be cited at appropriate places in the text.
- Make sure you have read the actual paper you are citing. It is not good practice to cite a paper merely because it was cited in a review article.
- Please read and heed the Plagiarism section.

The (electronic) essay DEADLINE is indicated in the Course timetable.

University Policies

Students are asked to make themselves familiar with the information on key institutional policies which been made available within MyAberdeen (**https://abdn.blackboard.com/bbcswebdav/institution/Policies**). These policies are relevant to all students and will be useful to you throughout your studies. They contain important information and address issues such as what to do if you are absent, how to raise an appeal or a complaint and indicate how seriously the University takes your feedback.

These institutional policies should be read in conjunction with this programme and/or course handbook, in which School and College specific policies are detailed. Further information can be found on the **University[1]s Infohub webpage** or by visiting the Infohub.

The information included in the institutional area for 2019/20 includes the following:

- Absence
- Appeals & Complaints
- Student Discipline
- Class Certificates
- MyAberdeen
- Originality Checking
- Feedback
- Communication
- Graduate Attributes
- The Co-Curriculum

Medical Sciences Common Grading Scale

Grade	Grade Point	Category	Honours Class	Description
A1	22	Excellent	First	• Outstanding ability and critical thought • Evidence of extensive reading • Superior understanding • The best performance that can be expected from a student at this level
A2	21			
A3	20			
A4	19			
A5	18			
B1	17	Very Good	Upper Second	• Able to argue logically and organise answers well • Shows a thorough grasp of concepts • Good use of examples to illustrate points and justify arguments • Evidence of reading and wide appreciation of subject
B2	16			
B3	15			
C1	14	Good	Lower Second	• Repetition of lecture notes without evidence of further appreciation of subject • Lacking illustrative examples and originality • Basic level of understanding
C2	13			
C3	12			
D1	11	Pass	Third	• Limited ability to argue logically and organise answers • Failure to develop or illustrate points • The minimum level of performance required for a student to be awarded a pass
D2	10			
D3	9			
E1	8	Fail	Fail	• Weak presentation • Tendency to irrelevance • Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts
E2	7			
E3	6			
F1	5	Clear Fail	Not used for Honours	• Contains major errors or misconceptions • Poor presentation
F2	4			
F3	3			
G1	2	Clear Fail/ Abysmal	-	• Token or no submission
G2	1			
G3	0			

Course Timetable PY4302: 2019-2020

Date	Time	Place	Subject	Session	Staff
Week 13					
Mon 21 Oct	11:00-12:00	LT3	Nervous system induction 1	Lecture	AMR
Tue 22 Oct					
Wed 23 Oct	11:00-12:00	LT3	Nervous system induction 2	Lecture	AMR
Thu 24 Oct	11:00-12:00	TBA by each group	1st Group Presentation meeting	Group	
Fri 25 Oct	11:00-12:00	LT3	Neurogenesis/Migration	Lecture	CDM
Week 14					
Mon 28 Oct	11:00-1200	LT3	Neuronal Motility	Lecture	CDM
Tue 29 Oct					
Wed 30 Oct	11:00-1200	LT3	Electrical guidance	Lecture	AMR
Thu 31 Oct	11:00-1200	LT3	Neurotrophic factors	Lecture	CDM
Fri 1 Nov	11:00-1200	LT3	Retina Development	Lecture	LE
Week 15					
Mon 4 Nov	11:00-1200	LT3	Wiring eye to brain	Lecture	LE
Tue 5 Nov					
Wed 6 Nov	11:00-1200	LT3	Exocytosis: quantal neurotransmitter release	Lecture	GSB
Thu 7 Nov	11:00-1200	TBA by each group	Group Presentation Final Practice	Group	
Fri 8 Nov	11:00-1200	LT3	Presentations by Groups 1 & 2	Presentations	AMR/GSB
Week 16					
Mon 11 Nov	11:00-1200	LT3	Presentations by Groups 3 & 4	Presentations	SND/GSB
Tue 12 Nov					
Wed 13 Nov	11:00-1200	LT3	Presentations by Groups 5 & 6	Presentations	GSB/TBD
Thu 14 Nov	11:00-1200	LT3	Presentation by Groups 7 & 8	Presentations	CDM/WH
Fri 15 Nov	11:00-1200	LT3	Presentation by Groups 9 & 10 **All groups submit Written summaries**	Presentations	MC/AMR
Week 17					
Mon 18 Nov	11:00-1200	LT3	Endocytosis and vesicle recycling	Lecture	GSB
Tue 19 Nov					
Wed 20 Nov	11:00-1200	LT3	Modulating neurotransmitter release	Lecture	GSB
Thu 21 Nov	11:00-1200	LT3	Genetic control of nervous function	Lecture	AGS
Fri 22 Nov	11:00-1200	LT3	Developing Pain	Lecture	WH
Week 18 - No teaching during this week REVISION WEEK					
Mon 25 Nov					
Tue 26 Nov					
Wed 27 Nov	11:00-1200		Essay Preparation	Lecture	
Thu 28 Nov					
Fri 29 Nov	17:00		Deadline: Course Essay	N/A	

Staff

Dr Guy S Bewick (GSB)
Prof Martin Collinson (MC)
Prof Lynda Erskine (LE)
Prof Stephen N Davies (SND)
Prof Colin D McCaig (CDM)

Dr Antonio Gonzalez Sanchez (AGS)
Dr Wenlong Huang (WH)
Dr Ann M Rajnicek (AMR), (Course Co-ordinator)