A close-up of a logo

Description automatically generated with low confidence



*PY4302- Developmental Neuroscience*

*Course Handbook 2023-2024*

*Undergraduate Medical Sciences*

*School of Medicine, Medical Sciences & Nutrition*

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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 functional 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 critical assessment of a research paper and a 2-hour written exam.

Course Aims & Learning Outcomes

* To consider how the central and peripheral nervous systems become established from undifferentiated cells and integrated to generate specific functions.
* To learn how nerves grow, how they move, how they transport materials, how they communicate, what signals regulate these activities and how the nervous system produces complex behaviours.
* To refine teamworking and scientific presentation skills by creating and delivering a scientific presentation based on primary scientific literature
* To hone skills in concise scientific writing (abstract writing)
* To assess a scientific publication critically (peer review).

Course Teaching Staff

Course Co-ordinator:

Dr Ann M. Rajnicek ([a.m.rajnicek@abdn.ac.uk](mailto:a.m.rajnicek@abdn.ac.uk))

Other Staff:

Dr Daniel Berg ([**daniel.berg@abdn.ac.uk**](mailto:daniel.berg@abdn.ac.uk))

Dr Guy S Bewick ([**g.s.bewick@abdn.ac.uk**](mailto:g.s.bewick@abdn.ac.uk)

Prof Martin Collinson ([**m.collinson@abdn.ac.uk**](mailto:m.collinson@abdn.ac.uk))

Dr Derek Garden ([**derek.garden@**abdn**.ac.uk**](mailto:derek.garden@abdn.ac))

Dr Antonio Gonzalez Sanchez ([**antonio.gonzalez@abdn.ac.uk**](mailto:antonio.gonzalez@abdn.ac.uk))

Dr Wenlong Huang ([**w.huang@abdn.ac.uk**](mailto:w.huang@abdn.ac.uk))

Dr Eunchai Kang (**eunchai.kang@abdn.ac.uk**)

Assessments & Examinations

Students are expected to access and study all lectures and online materials, and to complete all assignments by the given deadlines. Assessment consists of 30% continuous assessment and 70% course exam.

**Overall Course Assessment**

a). Online Critical analysis of a research paper - 15% of the course total.

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

* 7.5% Mark for group presentation
* 7.5% Individual written abstract/summary (limit-500 words)

c). Examination is 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 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](http://www.ausa.org.uk) or email the VP Education & Employability [vped@abdn.ac.uk](mailto: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](http://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 the medical sciences office, ([medsci@abdn.ac.uk](mailto:medsci@abdn.ac.uk)) (based in the Polwarth Building, Foresterhill) 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 (Professor 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 half session 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. Additional materials are available in a Leganto Reading List in MyAberdeen. If you have difficulty accessing materials, please contact the staff member delivering that component of the course (indicated in timetable).

Lecture Synopsis

**PART 1: BUILDING THE CNS**

**Lectures 1 & 2: Nervous system induction: Dr A. 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: Neuronal migration – Dr D. Garden**

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 – Dr D. Garden**

How newborn 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 axon guidance – Dr A. Rajnicek**

The nervous system develops within a natural electric field generated by embryonic epithelia and the neural tube itself. The effects this has on growing axons, the underlying cellular mechanisms and possible clinical uses will be discussed.

**Lecture 6: Neural Stem Cells in the Developing Brain: Dr D Berg**

Neural stem cells are the source of most of the cells in the brain, including neurons, astrocytes and oligodendrocytes. In this lecture we will discuss general features of neural stem cells and the techniques used to study their behaviour and potential. The students will also learn how brain organoids generated from induced pluripotent stem cells (IPSCs) can be used to study the development of the human brain in the dish.

**PART 2: LINKING ANATOMY, DEVELOPMENT, PHYSIOLOGY AND FUNCTION**

**Lecture 7: Adult Neurogenesis: Dr D Berg**

In some areas of the brain, neurogenesis is not restricted to development but continues into adulthood. In this lecture we will go through the different areas of the adult mammalian brain in which neurons are added and how this process is regulated. We will also discuss how adult neurogenesis is affected in the diseased human brain and what we can learn from adult neurogenesis to regenerate the injured brain.

**Lecture 8: Neurotrophic factors- Dr D. Garden**

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.

**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.

**Lecture 12: Genetic control of nervous function: Dr A. Gonzalez Sanchez**

Modern tools, including optogenetics and chemical genetics, can be used to control nervous system function. This lecture will consider how cutting-edge techniques reveal how neural circuitry underpins functional outcomes.

**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** (15% of course total) **Full details and further guidance are on MyAberdeen.**

During the first week the class will be divided into groups to research a topic and each group will make a PowerPoint presentation (see timetable). This exercise aims to promote confidence and self-directed research, so students should expect minimal direct participation by staff. However, a Tutor has been assigned to each group to help with issues that cannot be resolved within the group or to assist with difficult scientific concepts.

* The presentation content reinforces concepts from this course (and others) and is examinable. Therefore, students not able to attend in person are responsible for viewing the Panopto recordings. The recordings will also aid revision.
* The presentation topics, starter references, tutor contact information, guidelines, infographic examples and assessment marking sheets are on MyAberdeen. You are advised to look at these before you start work.

*Learning outcomes*:

* Collaborative effectively in a group to research a scientific topic.
* Prepare and deliver a scientific presentation aimed at a scientific audience
* Prepare and present an infographic aimed at a general (lay) audience.
* Hone writing skills in a concise, scientifically accurate abstract/summary.
* Practice targeting the same scientific concepts to diverse audiences: peers, scientific professionals, and the general (lay) public.

**Marked elements:**

**Group Presentation**

* ***Group mark (7.5% total)*** *arising from the oral presentations*
  + Scientific **ORAL PRESENTATION (6%)**. The mark is an assessment by the audience (students and staff) reflecting style and content and will be awarded to the whole group. The target audience is your peers.
  + I**NFOGRAPHIC** aimed at the general public **(1.5%**). The final slide of the presentation (place after the scientific conclusions/summary) should be a general audience ‘Infographic’ that targets a lay audience, assuming a reasonable scientific knowledge of cells, proteins etc. It should relay the Take Home message of the presentation topic simply, in an eye catching and scientifically accurate way. Although it should work as a stand-alone item, one person should ‘walk the audience’ through the infographic (build one or two minutes into the overall timing).
* **Individual mark components (7.5%**)
  + ***SUMMARY*** *(7.5%)- Each student* is required to prepare an independent abstract (summary) of *their Group’s topic*. This component reflects your *own* interpretation of the entire topic, knitting together the whole group’s research, not just your bit. The target audience for this part of the assessment is a professional scientist/lecturer.

**Group meetings**. Groups are responsible for organising meetings themselves. These sessions can be the library, a coffee shop, or online, and should be agreed by the group. It is expected that **the group will meet at least once during the first week of the course**. Be flexible, but mindful of the time required to complete the task. The group should practice the presentation together before their scheduled presentation day.

Each group should divide itself into subgroups, each taking responsibility for researching one aspect of the topic. Decide on presentation structure and who will cover each part, working together to share information and to and discuss findings. Meeting conduct is to be professional and respectful. A successful presentation should make a coherent story without repetition. Groups presenting on the same day will cover related topics, so discuss potential overlap with the other group to avoid repetition. **IMPORTANT**-If someone fails to connect with the group early on, you are responsible for telling the tutor/course coordinator as soon as possible so any problems can be identified and resolved.

**Written abstract/summary (contributes 7.5% to course mark)** MyAberdeen submission

* Prepared as an individual but incorporates research gathered by other group members. Share information and work cooperatively.
* Snappy and to the point. No waffle, no bullet points.
* It should represent the content of the *entire* topic, not just the part you researched.
* **Strict** **500-word limit**- include the word count at the end of the summary
* Figures are permitted and are very useful for presenting complex concepts. However, they must be referred to in the text and each needs a brief figure legend, which will eat into your word count. So, use them wisely. Figures ‘borrowed’ or ‘adapted’ from published work need to cite the appropriate reference.
* Include key references, 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, proving to the marker that you have identified key references. These are likely to include relevant papers not provided in the *starter references*.

Treat these topics as you would any other lecture material. Students attending the presentation (non-presenting group) are expected to contribute actively by asking questions after the presentations. Panopto recordings will be made available for revision.

**Online assessment of a recent research paper (15% of final mark)**

This online assignment (Lt KuraCloud). **The submission DEADLINE is indicated in the Course timetable.**

You will complete a critical assessment of a research paper. Effectively, you will play the role of a reviewer for a journal to determine the strength (or not) of the experimental design, statistical methods, presentation, and the interpretation of the data. Would you have recommended publication? Why or why not? What are the paper’s strengths/weaknesses? What would you have done differently to improve the study design/interpretation/presentation of the work? Or is it already perfect? This is not a group task; you should complete it on your own. The scientific content is relevant to Developmental Neuroscience and has been specifically selected to be accessible to students across all disciplines enrolled in PY4302.

*Learning outcomes*:

* Learn to evaluate written scientific work critically, including data analysis and presentation style.
* Preparation for writing/presenting your future honours thesis work.
* Practice data analysis and interpretation- preparation for the future data analysis exam.

University Policies

Students are asked to make themselves familiar with the information on key education policies, available [**here**](https://www.abdn.ac.uk/staffnet/teaching/key-education-policies-for-students-11809.php). 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 how the University will calculate your degree outcome.

These University wide education policies should be read in conjunction with this programme and/or course handbook, in which School specific policies are detailed. These policies are effective immediately, for the 2023/24 academic year. Further information can be found on the [**University’s Infohub webpage**](https://www.abdn.ac.uk/students/) or by visiting the Infohub.

The information included in the institutional area for 2023-24 includes the following:

* Assessment
* Feedback
* Academic Integrity
* Absence
* Student Monitoring/ Class Certificates
* Late Submission of Work
* Student Discipline
* The co-curriculum
* Student Learning Service (SLS)
* Professional and Academic Development
* Graduate Attributes
* Email Use
* MyAberdeen
* Appeals and Complaints

Where to Find the Following Information:

C6/C7- University of Aberdeen Homepage > Students > Academic Life > Monitoring and Progress > Student Monitoriung (C6 & C7)

https://www.abdn.ac.uk/students/academic-life/student-monitoring.php#panel5179

Absences- To report absences you should use the absence reporting system tool on Student Hub. Once you have successfully completed and sent the absence form you will get an email that your absence request has been accepted. The link below can be used to log onto the Student Hub Website and from there you can record any absences you may have.

[Log In - Student Hub (ahttps://www.abdn.ac.uk/studenthub/loginbdn.ac.uk)](https://www.abdn.ac.uk/studenthub/login)

Submitting an Appeal- University of Aberdeen Homepage > Students > Academic Life > Appeals and Complaints

https://www.abdn.ac.uk/students/academic-life/appeals-complaints-3380.php#panel2109

Academic Language & Skills support

For students whose first language is not English, the Language Centre offers support with Academic Writing and Communication Skills.

Academic Writing

* Responding to a writing task: Focusing on the question
* Organising your writing: within & between paragraphs
* Using sources to support your writing (including writing in your own words, and

citing & referencing conventions)

* Using academic language
* Critical Thinking
* Proofreading & Editing

Academic Communication Skills

* Developing skills for effective communication in an academic context
* Promoting critical thinking and evaluation
* Giving opportunities to develop confidence in communicating in English
* Developing interactive competence: contributing and responding to seminar discussions
* Useful vocabulary and expressions for taking part in discussions

More information and how to book a place can be found here

Medical Sciences Common Grading Scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Grade | Grade Point | % Mark | Category | Honours Class | Description |
| A1 | 22 | 90-100 | 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 | 85-89 |  |
|  |
| A3 | 20 | 80-84 |  |
|  |
| A4 | 19 | 75-79 |  |
|  |
| A5 | 18 | 70-74 |  |
|  |
| B1 | 17 | 67-69 | 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 | 64-66 |  |
|  |
| B3 | 15 | 60-63 |  |
|  |
| C1 | 14 | 57-59 | 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 | 54-56 |  |
|  |
| C3 | 12 | 50-53 |  |
|  |
| D1 | 11 | 47-49 | 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 | 44-46 |  |
|  |
| D3 | 9 | 40-43 |  |
|  |
| E1 | 8 | 37-39 | 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 | 34-36 |  |
|  |
| E3 | 6 | 30-33 |  |
|  |
| F1 | 5 | 26-29 | Clear Fail | Not used for Honours | • Contains major errors or misconceptions • Poor presentation |  |
|  |
| F2 | 4 | 21-25 |  |
|  |
| F3 | 3 | 16-20 |  |
|  |
| G1 | 2 | 11-15 | Clear Fail/Abysmal |  | • Token or no submission |  |
|  |
| G2 | 1 | 1-10 |  |
|  |
| G3 | 0 | 0 |  |
|  |

Course Timetable PY4302: 2023-2024

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date | Time | Place | Subject | Session | Staff |
| Week 13 | | | | | |
| Mon 23 Oct | 11:00-12:00 | Polwarth 2:054 | Lecture 1- Nervous System Induction 1 | Lecture | AMR |
| Tue 24 Oct |  |  |  |  |  |
| Wed 25 Oct | 11:00-12:00 | Polwarth 2:054 | Lecture 2- Nervous system induction 2 | Lecture | AMR |
| Thu 26 Oct | 11:00-12:00 | Polwarth 2:054 | Tutorial 1: Concise Scientific Writing | Tutorial | AMR |
| Fri 27 Oct | 11:00-12:00 | BIOMEDICAL PHYSICS LECTURE THEATRE | Tutorial 2: Scientific paper critique/peer review | Lecture | AMR |
| Week 14 | | | | | |
| Mon 30 Oct | 11:00-1200 | Polwarth 2:054 | Lecture 3- Neuronal migration | Lecture | DG |
| Tue 31 Oct |  |  |  |  |  |
| Wed 1 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 4- Neuron motility | Lecture | DG |
| Thu 2 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 5- Electrical axon guidance | Lecture | AMR |
| Fri 3 Nov | 11:00-1200 | BIOMEDICAL PHYSICS LECTURE THEATRE | Lecture 6- Neural stem cells in the developing brain | Lecture | DB |
| Week 15 | | | | | |
| Mon 6 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 7- Adult Neurogenesis | Lecture | DB |
| Tue 7 Nov |  |  |  |  |  |
| Wed 8 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 8- Neurotrophic factors | Lecture | DG |
| Thu 9 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 9- Exocytosis: quantal neurotransmitter release | Lecture | GSB |
| DEADLINE | MyAberdeen | All groups- submit final PowerPoint slides | DEADLINE |  |
| Fri 10 Nov | 11:00-1200 | Polwarth 2:054 | Presentations by Groups 1 & 2 Gut-Brain axis | Presentations | AMR/DG/EK |
| Week 16 | | | | | |
| Mon 13 Nov | 11:00-1200 | BIOMEDICAL PHYSICS LECTURE THEATRE | Presentations by Groups 3 & 4- LTP/memory | Presentations | DG/AMR |
| Tue 14 Nov |  |  |  |  |  |
| Wed 15 Nov | 11:00-1200 | Polwarth 2:054 | Presentations by Groups 5 & 6 -Neuromuscular junction/plasticity | Presentations | GSB/AMR |
| Thu 16 Nov | 11:00-1200 | Polwarth 2:054 | Presentation by Groups 7 & 8 Schizophrenia | Presentations | EK/AMR |
| Fri 17 Nov | 11:00-1200 | Polwarth 2:054 | Presentation by Groups 9 & 10- Radial glia/Mueller glia | Presentations | MC/AMR |
| DEADLINE | MyAberdeen | All groups- submit Written summaries | DEADLNE |  |
| Week 17 | | | | | |
| Mon 20 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 10- Endocytosis and vesicle recycling | Lecture | GSB |
| Tue 21 Nov |  |  |  |  |  |
| Wed 22 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 11- Modulating neurotransmitter release | Lecture | GSB |
| Thu 23 Nov | 11:00-1200 | Polwarth 2:054 | Lecture 12- Genetic control of nervous function | Lecture | AGS |
| Fri 24 Nov | 11:00-1200 | BIOMEDICAL PHYSICS LECTURE THEATRE | Lecture 13- Developing Pain | Lecture | WH |
| Week 18 | | | | | |
| Mon 28 Nov |  |  |  |  |  |
| Tue 29 Nov |  |  |  |  |  |
| Wed 30 Nov |  |  |  |  |  |
| Thu 1 Dec |  |  |  |  |  |
| Fri 2 Dec |  |  | Deadline- Lt assignment | N/A |  |

Staff

|  |
| --- |
| Dr Ann M Rajnicek (AMR), (Course Co-ordinator) |
| Dr Daniel Berg (DB) |
| Dr Guy S Bewick (GSB) |
| Prof Martin Collinson (MC) |
| Dr Eunchai Kang (EK) |
| Dr Derek Garden (DG) |
| Dr Antonio Gonzalez Sanchez (AGS) |
| Dr Wenlong Huang (WH) |
| Teaching Venues |
| Room 2:054, Polwarth Building, Foresterhill |
| Biomedical Physics Lecture Theatre, Medical Physics Building, Foresterhill |

Campus Maps - Foresterhill



Polwarth Floor Plans

Diagram, schematic

Description automatically generated

Diagram

Description automatically generated

Diagram

Description automatically generated