BIOL257

Neurophysiology

S1 External 2019

Dept of Biological Sciences

Contents

General Information	2
Learning Outcomes	3
General Assessment Information	3
Assessment Tasks	4
Delivery and Resources	7
Policies and Procedures	9
Graduate Capabilities	10
Changes from Previous Offering	16

General Information

Unit convenor and teaching staff
Unit Convenor
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Technical Manager
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Credit points
3

Prerequisites
15cp at 100 level including (BIOL108 and BIOL115) or ((BIOL108 or BIOL115) and (BBE100 or BIOL114 or BIOL116 or BIOL122 or COGS100 or HLTH108 or PSYC104))

Corequisites

Co-badged status

Unit description
This Unit considers the structure and function of the human nervous system. We begin with a discussion on how the selective permeability of the cell membrane gives rise to the electrical properties of cells, in particular nerve and muscle cells. We look in detail at the generation, propagation and transmission of neural signals, and examine the important principles of sensory physiology such as transduction, adaptation and stimulus coding. Students then study the anatomy and functional organization of the central and peripheral nervous systems. Having covered these basic principles, the Unit goes on to explore the somatosensory system, which is involved in proprioception and the perception of touch, pain and temperature. The nerves and organs that give rise to the special senses (vision, hearing, taste and smell) are also discussed. We next examine the structure and physiology of muscle cells, and the central control of motor functions. Lastly, we cover the autonomic nervous system and the neuroendocrine system, both of which regulate numerous physiological processes throughout the body.This unit is designed to serve science, medical science and chiropractic students, and is also of interest to students studying psychology with an emphasis on physiology.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Identify the major structural features of the central and peripheral nervous systems

Differentiate between the major functional subdivisions of the nervous system

Relate cellular structure and physiology to the generation of membrane potentials

Explain how neural signals are generated, propagated and transmitted

Summarise the diverse sensory receptors and sensory pathways found in the human body

Understand the neural basis of learning, memory and pain

Explain how muscles work and how the nervous system coordinates motor activity

Describe how the nervous system and endocrine system interact to regulate physiological processes

Understand the basis for and uses of standard electrophysiological and neuroimaging techniques

Explore the scientific literature to learn about specific aspects of the nervous system

Present information to your peers in a concise format, both individually and as part of a group

Assemble basic electrophysiology recording equipment and perform simple electrophysiological experiments

Analyse and interpret the results of simple tests of neural function on human and/or invertebrate animal subjects

General Assessment Information

Assessment details

Details of assessments will provided on iLearn and in class

Lab report submission

Lab reports should be submitted as Word documents through the relevant Turnitin submission link on iLearn or as otherwise instructed.

Academic honesty

Assessments must be written by the student and in the students own words. Unless otherwise indicated, all assessments must be submitted online through iLearn and will be scanned and

assessed for plagiarism using the Turnitin software. Penalties for plagiarism will be imposed as described in the assessment rubric. Additional penalties may be imposed by the Faculty Disciplinary Committee as per the Macquarie University Academic Integrity Policy.

Extensions, late submissions, absences, and Special Considerations

If you experience a serious and unavoidable disruption to your studies and require an extension for an assessment you must submit an application for Special Consideration via Ask MQ and provide supporting documentation such as a Professional Authority Form. If you anticipate a potentially serious and unavoidable disruption (e.g. scheduled surgery) please contact the Unit Convenor (biol257@mq.edu.au) as early as possible to apply for an extension before the due date. Macquarie operates a "Fit to Sit" policy (see the policy document) and this applies to both the mid-semester and final examinations. Do not sit an exam if you are sick; instead, notify the Unit convenor immediately and submit a Special Consideration request via Ask MQ. If you fail to submit an assessment by the due date or do not sit a scheduled exam, you will receive zero marks for that assessment item, unless a Special Consideration request is submitted and approved as per the policy. Similarly, given that lab class attendance is a hurdle for completion of the Unit, any absences from lab classes must be accompanied by a Special Consideration request.

Unit completion

To pass the Unit you must achieve an overall mark of 50% and you must attend a minimum of 7 out of the 10 practical lab classes (this total excludes the compulsory mid-semester test and the optional revision session), remembering also that if you do not attend a lab class for which there is an assessable component you will get zero marks for that assessment.

Assessment Tasks

Name	Weighting	Hurdle	Due
Lab Classes	0%	Yes	On-campus sessions
Lab Reports	28%	No	TBA
Mid-Semester Test	15%	No	16 April
Group Presentation	7%	No	18 May
Final Exam	50%	No	Examination Period

Lab Classes

Due: **On-campus sessions**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle

assessment tasks)

Lab classes will be held during the two 2-day on-campus sessions in April and May. Lab class attendance is a hurdle requirement and you must attend a minimum of 7 out of the 10 lab classes (this total excludes the mid-semester test and the revision session) in order to pass the unit. An attendance register will be kept and it is your responsibility to sign in every session.

On successful completion you will be able to:

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Explain how muscles work and how the nervous system coordinates motor activity
- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques
- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group
- Assemble basic electrophysiology recording equipment and perform simple electrophysiological experiments
- Analyse and interpret the results of simple tests of neural function on human and/or invertebrate animal subjects

Lab Reports

Due: **TBA**
Weighting: **28%**

Six of the lab classes have assessable activities that require students to submit a completed worksheet or lab report for assessment, either during the lab class or shortly afterwards. Further details will be provided on iLearn.

On successful completion you will be able to:

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the basis for and uses of standard electrophysiological and neuroimaging

techniques
- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group
- Assemble basic electrophysiology recording equipment and perform simple electrophysiological experiments
- Analyse and interpret the results of simple tests of neural function on human and/or invertebrate animal subjects

Mid-Semester Test

Due: **16 April**
Weighting: **15%**

The mid-semester test will be held in the lab class slots during the first on-campus session and will test your knowledge of the material covered in the lectures from Weeks 1-7 and the lab class topics covered in the first on-campus session.

On successful completion you will be able to:

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the neural basis of learning, memory and pain
- Explain how muscles work and how the nervous system coordinates motor activity
- Describe how the nervous system and endocrine system interact to regulate physiological processes
- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques

Group Presentation

Due: **18 May**
Weighting: **7%**

Group presentations will be held in the lab class slots during the second on-campus session. You will work together with other team members in a small group to prepare and deliver a short (20 minute) presentation on a topic selected from a list provided by the teaching staff. The presentation will be assessed by both the teaching staff and your peers.

On successful completion you will be able to:

- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques
- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group

Final Exam

Due: **Examination Period**
Weighting: **50%**

The final exam will be held during the Semester 1 examination period. The exam will test your knowledge of the topics covered in all lectures and lab classes. Further details of the exam format will be provided closer to the time.

On successful completion you will be able to:

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the neural basis of learning, memory and pain
- Explain how muscles work and how the nervous system coordinates motor activity
- Describe how the nervous system and endocrine system interact to regulate physiological processes
- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques

Delivery and Resources

Lectures

Lectures will be delivered on Monday afternoons from 4-6pm (16:00–18:00); T1 Theatre (29 Wallys Walk). Lectures will be recorded with Echo360 and PDFs of the PowerPoint slides will be made available on iLearn (www.mq.edu.au/iLearn). iLearn is also the main point of contact used to disseminate information about the Unit

Laboratory classes for External students (see iLearn for further information regarding timing and content):

- Monday 15 April 09:00 - 17:00 in F7B science labs (04WW) 102, 105 & 110
- Tuesday 16 April 09:00 - 17:00 in F7B science labs (04WW) 102, 105 & 110
- Saturday 18 May 09:00 - 17:00 in F7B science labs (04WW) 102, 105 & 110
- Sunday 19 May 09:00 - 17:00 in F7B science labs (04WW) 102, 105 & 110

Additional information about laboratory classes:

- Lab classes are **compulsory** and students must attend the class into which they have enrolled;
- This year, 6 of the lab classes have an assessable component in the form of a written lab report using information or data gathered during the lab class.
- The mid-semester test and an assessed group presentation exercise will also be held in the lab class slots;
- If through misadventure you are unable to attend a lab class you must apply for Special Consideration and where possible catch-up the lab class with the internal students. If you do not apply for (or do not receive) a Special Consideration for an absence from any of the assessed lab classes and do not make these up at the on-campus sessions you will receive a mark of zero for that lab class report;
- Students must enrol into one of the lab classes through eStudent;
- Students must not exchange their lab class slot. However, in special circumstances, students may request a specific change. These requests are to be submitted by emailing biol257@mq.edu.au
- An attendance register will be held and must be signed by all students at the start of each practical class. Please note that signing for someone else is a breach of the Academic Integrity Policy and will be treated as such;
- Please remember that all lab classes and the mid-semester test will be held in the F7B laboratories and **you must wear enclosed footwear at all times when in the labs, including for exams**. Due to WHS regulations, we are not allowed to let any student into the lab if they do not wear appropriate shoes;
- Several lab activities involve experimentation on invertebrates (worms, crickets). If for religious or cultural reasons you are unable to participate in such experiments please contact the Unit Convenor (biol257@mq.edu.au) to discuss this prior to the start of the Semester.
- Lab classes are also a great forum to discuss any concepts that you are struggling to understand or are particularly interested in.

Recommended text

- Stanfield, C. L. (2017) "Principles of Human Physiology" (6th Edition). Pearson. ISBN: 9781292156484. Available through the Macquarie Co-Op Bookshop. The 5th Edition is also suitable.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group

Assessment tasks

- Lab Classes
- Lab Reports
- Group Presentation

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group

Assessment tasks

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- Lab Reports
- Group Presentation

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the neural basis of learning, memory and pain

- Explain how muscles work and how the nervous system coordinates motor activity
- Describe how the nervous system and endocrine system interact to regulate physiological processes
- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques
- Explore the scientific literature to learn about specific aspects of the nervous system
- Present information to your peers in a concise format, both individually and as part of a group
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Assessment tasks

- Lab Classes
- Lab Reports
- Mid-Semester Test
- Group Presentation
- Final Exam

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
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Assessment tasks

- Lab Classes
- Lab Reports
- Mid-Semester Test
- Group Presentation
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the neural basis of learning, memory and pain
- Explain how muscles work and how the nervous system coordinates motor activity
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- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques
- Explore the scientific literature to learn about specific aspects of the nervous system
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- Assemble basic electrophysiology recording equipment and perform simple electrophysiological experiments
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Assessment tasks

- Lab Classes
- Lab Reports
- Mid-Semester Test
- Group Presentation
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Identify the major structural features of the central and peripheral nervous systems
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
- Understand the basis for and uses of standard electrophysiological and neuroimaging techniques
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- Analyse and interpret the results of simple tests of neural function on human and/or invertebrate animal subjects

Assessment tasks

- Lab Classes
- Lab Reports
- Group Presentation

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Identify the major structural features of the central and peripheral nervous systems
- Differentiate between the major functional subdivisions of the nervous system
- Relate cellular structure and physiology to the generation of membrane potentials
- Explain how neural signals are generated, propagated and transmitted
- Summarise the diverse sensory receptors and sensory pathways found in the human body
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- Present information to your peers in a concise format, both individually and as part of a group
- Analyse and interpret the results of simple tests of neural function on human and/or invertebrate animal subjects

Assessment tasks

- Lab Classes
- Lab Reports
- Group Presentation
- Final Exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Present information to your peers in a concise format, both individually and as part of a group

Assessment tasks

- Lab Classes
- Lab Reports
- Group Presentation

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

- Present information to your peers in a concise format, both individually and as part of a group

Assessment tasks

- Lab Classes
- Group Presentation

Changes from Previous Offering

Several changes to Unit content and the assessment tasks have been made in response to student feedback and curriculum design. In particular, there are now assessable lab-based activities and a group presentation activity instead of a written essay. There are no longer assessed weekly quizzes in iLearn.