Faculty of Medicine
School of Medical Sciences

NEUR 3221

Neurophysiology

COURSE OUTLINE AND PRAC MANUAL

SEMESTER 2, 2018

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Please read this outline in conjunction with the following pages on the School of Medical Sciences website:

- Advice for Students
- Learning Resources

(or see "STUDENTS" tab at medicalsciences.med.unsw.edu.au)

NEUR3221 Course Information

Neurophysiology (NEUR3221) is a stage three course worth six units of credit (6 UOC) administered by the School of Medical Sciences. It is delivered across 12 teaching weeks in session 2, with six contact hours per week. NEUR3121 can be undertaken upon successful completion of Physiology 1A (PHSL2101 / 2121 / 2501). The course can contribute to a study plan in Physiology or Neuroscience for the Bachelor of Science or Bachelor of Medical Sciences.

In 2018, Neurophysiology (NEUR3221) will commence in the week beginning 23 July.

The content of the course provides an understanding of how cells in the nervous system work together to perform various functions. This course complements Molecular and Cellular Neuroscience (NEUR3121) which focuses on the structure and function of individual neurons and their ion channels and receptors. Students also find that this course complements Muscle and Motor Control (NEUR3101), Neuroanatomy (ANAT3411), and Neuropharmacology (PHAR3202).

OBJECTIVES OF THE COURSE

To gain an understanding of the principles of neurophysiology by:

- using molecular, synaptic and cellular processes to explain brain function
- grasping the relationship between experimental techniques and the data they produce

COURSE CO-ORDINATOR and LECTURERS

Course Coordinator:

Dr John Power
Rm 303 Wallace Wurth Building
ph: 9385 2910 john.power@unsw.edu.au

Course Co-Coordinator

Dr. Gila Moalem-Taylor
Translational Neuroscience Facility,
Level 3 Wallace Wurth Building
ph: 9385 2478 gila@unsw.edu.au

Students wishing to see the course coordinators should make an appointment *via* email as our offices are not readily accessible. We will organize to meet you in a convenient location elsewhere in the building.

Lecturers in this course:

A/Prof Pascal Carrive	p.carrive@unsw.edu.au
Dr. Martin Héroux	m.heroux@neura.edu.au
Prof Gary Housley	g.housley@unsw.edu.au
Georg Von Jonquieres	g.jonquieres@unsw.edu.au
Dr. Natasha Kumar	natasha.kumar@unsw.edu.au
Terry Trinh	terry.trinh@sydney.edu.au
Dr Richard Vickery	richard.vickery@unsw.edu.au

COURSE STRUCTURE and TEACHING STRATEGIES

Learning activities occur on the following days and times:

- Lectures: Monday 9-10 am, Monday 10-11 pm
- Tutorials: Wednesday 12–1 pm or 1-2 pm
- Practicals: Monday 11-2 pm or 3-6 pm

Students are expected to attend all scheduled activities for their full duration (3 hours of lectures / tutorials per week and up to 3 hours of practical sessions per week). Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150 hours of study and learning activities. The formal learning activities are approximately 72 hours throughout the semester and students are expected to do at least the same number of hours of additional study.

Lectures will provide you with the concepts and theory essential for an understanding of neurophysiology. To assist in the development of research and analytical skills practical classes and tutorial learning sessions will be held. These classes allow students to engage in a more interactive form of learning than is possible in the lectures. The skills you will learn in practical classes are relevant to your development as professional scientists.

APPROACH TO LEARNING AND TEACHING

The learning and teaching philosophy underpinning this course is centred on student learning and aims to create an environment which interests and challenges students. The teaching is designed to be engaging and relevant in order to prepare students for future careers.

Although the primary source of information for this course is the lecture material, effective learning can be enhanced through self-directed use of other resources such as textbooks and Web based sources. Your practical classes will be directly related to the lectures and it is essential to prepare for practical classes before attendance. It is up to you to ensure you perform well in each part of the course; preparing for classes; completing assignments; studying for exams and seeking assistance to clarify your understanding.

TEXTBOOKS AND OTHER RESOURCES

Prescribed Textbook

Neuroscience: Exploring the Brain. 4th edition, 2015
Bear, Connors & Paradiso
Williams & Wilkins, ISBN-13: 978-0781778176

Recommended Textbooks:

Neuroscience.5th edition, 2012
Purves, Augustine, Fitzpatrick, Hall, LaMantia & White
Sinaur Associates ISBN 978-0-87893-695-3

Principles of Neural Science, 5th edition, 2012
Kandel, Schwartz, Jessell, Siegelbaum & Hudspeth AJ (Editors)
McGraw-Hill. ISBN 978-0071390118
[An advanced textbook for extended reading. Copies held in the UNSW library]

The books are available from the UNSW Bookshop, and limited copies are held by the UNSW library. Other resources:
medicalsciences.med.unsw.edu.au/students/undergraduate/learning-resources

STUDENT LEARNING OUTCOMES

Specific Learning outcomes:
By the end of this course students are expected to have gained:

- a demonstrable knowledge of the scope of neurophysiology, and detailed knowledge in some areas including somatosensory system and synaptic plasticity.
- experience in applying basic physical and physiological principles to resolve questions related to brain and behaviour.
- experience and expertise in critical enquiry by designing and executing a neurophysiological experiment.
- by practical experience and critical review, an appreciation of the relationship between the experimental techniques that provide neurophysiological data, and the constraints on interpretation that the techniques impose.

Faculty of Science and UNSW graduate attributes are found at:
medicalsciences.med.unsw.edu.au/students/undergraduate/advice-students#graduate

COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students about the course and continual improvements are made based on this feedback. Below is a summary of the feedback and our response to how we will improve this year's course delivery.

Student Feedback from MyExperience and Class Representatives:
Student feedback indicated the best aspects of the course were the interesting content interactive lab sessions, and cohesion between lectures, labs and tutorials. Suggestions for improving the course included: providing more background for topics, adding weekly quizzes for the course content, reducing the weighting of the mid-term exam, posting explanations for the tutorial exercises, and making the computer simulations easier / less tedious.

Outcomes of end of term course review:
Feedback from students was considered when the course was reviewed at the end of the year. We have responded to the feedback by:

1. Dedicating additional lecture time and / or online activities toward providing an overview of the topic
2. Assessing more theory from lectures in the prelab quizzes to provide feedback on student knowledge of the topic
3. Reducing the weighting on the midterm exam from 30 to 25 %
4. Explanations for the tutorial exercises will be posted on Moodle
5. Computer simulations and instructions have been revised

Student Representatives
Students enrolled in the course will be invited to elect student representatives who will meet with the course conveners on two occasions during the session, in a student feedback forum. The representatives need to seek feedback from their colleagues on the content, delivery and relevance of the course and any other issues that arise. The information gathered from this process will be used to inform any future improvements to the course.

ASSESSMENT PROCEDURES

Prelab quizzes (1% x 7)	7%
Midterm Exam	25%
DIY practical	
Group experimental plan – risk assessment - SWP	5%
Group prac report	15%
Individual peer mark	5%
End of Session Exam (2 hour duration)	43%

A penalty will apply for late submissions of assessment tasks (10% per day).

Material pertaining to both the lectures, tutorial and practical classes will be examined in both the midterm and end of session exams.

There will be **prelab quizzes for** each of the structured practicals (There will be no quiz associated with the DIY practical). These quizzes and prelab videos will be made available online the Friday prior to the practical. These quizzes based on the lecture and prelab video content serve to prepare you for the practical. You will receive immediate feedback after submitting your answers. The quizzes are to be attempted in your own time and each quiz will be close at the start of the practical session. You may attempt these quizzes as many times as you wish. The quiz will only contribute to the overall grade if you achieve a minimum score of 80% for the quiz.

The midterm exam will be comprised of short answer questions, multiple choice and/or short calculations. The questions will be based on the material covered in the lectures, tutorials and practical classes. The purpose of the exam is to provide feedback to students on their understanding and application of the concepts developed in the course and to prepare students for the final exam.

The DIY practical. Students will, in groups, design and complete their own neurophysiology practical. Each group is to submit their experimental design, a risk assessment and safe work procedure via Moodle, prior to the mid-term break; Friday 21 September 5pm. Three prac sessions (08 October, 15 October, and 22 October) will be dedicated to the DIY prac. All students are expected to initiate their experiments during 08 October session. Students will spend the second session completing their experiments and / or analysing data. The group DIY prac report is due Thursday the 25th of October 11:59 pm. After submission of the prac report, each student will detail and evaluate the contributions of the other group members to the project and the preparation of the report. Students will receive an individual mark based on the assessment of their peers.

The end of session exam will be comprised of short answer questions, multiple choice and/or short calculations that may include some simple calculations. The short answer questions will be based on the material covered in the lectures, tutorials and practical classes. The exam is comprehensive; material covered in the mid-term exam may be again examined in the final exam. The lecturer who provided the question will mark the short answer questions. Students are advised to use the list of previous exam questions provided to self-evaluate their progress during the course, although questions from year to year may vary as the content of the course is developed.

GENERAL INFORMATION

The Department of Physiology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located in the Wallace Wurth building (C27). General enquiries can be made by email at somsenquiries@unsw.edu.au (office hours are 9.00 am - 5:00 pm).

Professor Gary Housley is Head of the Department of Physiology and appointments to see him may be made through email (G.Housley@unsw.edu.au).

There are two honours programs available through the School of Medical Sciences. The School of Medical Sciences and the School of Psychology jointly run the Neuroscience Honours program coordinated by Dr John Power john.power@unsw.edu.au. In addition, the School of Medical Sciences Honours also offers a program is coordinated by Dr Greg Smith g.smith@unsw.edu.au.

Any students considering an Honours year should discuss the requirements with the coordinator. Please see:
Neuroscience:
medicalsciences.med.unsw.edu.au/students/undergraduate/neuroscience/honours

SoMS:
medicalsciences.med.unsw.edu.au/students/soms-honours/overview

Postgraduate research degrees
The School of Medical Sciences offers students the opportunity to enter into a Masters (MSc) or Doctorate (PhD) program in Physiology. For further information contact the Postgraduate Coordinator, Dr Pascal Carrive: p.carrive@unsw.edu.au
Please see: medicalsciences.med.unsw.edu.au/students/postgraduate-research/overview

Enrolment and administrative help
The Education Support Team are available to help with problems with enrolment and scheduling, and should be the first point of contact for administrative problems. They can be contacted on 9385 2464, SOMSenquiries@unsw.edu.au

Attendance Requirements

For details on the Policy on Class Attendance and Absence see Advice for Students and the Policy on Class Attendance and Absence.
Guidelines on extra-curricular activities affecting attendance can be found on the School of Medical sciences Website under Special Consideration.

Attendance at laboratory and tutorial classes is compulsory and must be recorded in the class roll on the day of the class. Arrival more than 15 minutes after the start of the class will be recorded as non-attendance. It is your responsibility to ensure that the demonstrator records your attendance and no discussions will be entered into after the completion of the class. Satisfactory completion of the work set for each class is essential. It should be noted that non-attendance for other than documented medical or other serious reasons, or unsatisfactory performance, for more than one practical class or one tutorial class per course may result in an additional practical assessment exam or in ineligibility to pass the course.

Special Consideration

Please see UNSW-Special Consideration and Student Advice-Special Consideration

The supplementary exam for Semester 2, 2018 will be held from 8 to 15 December 2018.

If you unavoidably miss an exam in NEUR3221, you must lodge an application with UNSW Student Central for special consideration. If your request for consideration is granted an alternative assessment will be organised which may take the form of a supplementary exam or increased weighting of the final exam.

Academic Integrity and Plagiarism

The UNSW Student Code outlines the standard of conduct expected of students with respect to their academic integrity and plagiarism. More details of what constitutes plagiarism can be found here.

Practical Classes

The practical class is an opportunity for students to develop graduate attribute 3 by behaving in an ethical, socially responsible and professional manner within the practical class.
Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. In the interests of safety, special attention should be paid to any precautionary measures recommended in the notes. If any accidents or incidents occur they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.

For more details see Advice for Students-Practical Classes

COURSE THEMES

The course timetable is appended to these notes

The course is divided into the following themes:

Foundations: Introduction to nervous system function
Neurons and Glia [Moalem-Taylor]
Structure & Function [Moalem-Taylor]
Role of glia in pathological conditions tutorial [Moalem-Taylor]

Foundations: Neural communication
Synaptic Transmission [Power]
Simple Neuronal Networks [Power]
Dissecting Neural circuits tutorial [Power]

Sensory systems: Touch and pain 1
Neural Coding [Vickery]
Peripheral Tactile [Vickery]
Neural coding tutorial [Vickery]

Sensory systems: Touch and pain 2
Central Tactile [Vickery]
Introduction to Pain [Moalem-Taylor]
Pain tutorial [Moalem-Taylor]

Sensory systems: Hearing
Introduction to Hearing: the Cochlea [Housley]
Central Auditory Pathways [Housley]
Cochlear Pathophysiology tutorial [Housley]

Sensory systems: Proprioception
Kinaesthesia [Héroux]
Kinaesthesia II [Héroux]
Kinaesthesia tutorial [Héroux]

Experimental Planning
Designing an experiment [Power]

Higher order processing: Memory Plasticity and Motivation
Memory Systems [Power]
Memory & Synaptic Plasticity [Power]
Motivated learning [Power]
Learning associated plasticity tutorial [Power]

CNS dysfunction
Peripheral Neuropathy [Trihn]
Addiction [Power]
NS dysfunction tutorial [TBD]

Autonomic Systems
ANS [Kumar]
Hypothalamic Regulation of Autonomic Function [Carrive]
ANS tutorial [Kumar]

Future Therapies

Neuro-prosthetics [Vickery]
Gene therapy [von Jonquieres]
Neural Prosthetics tutorial [Vickery]

LECTURE AND TUTORIAL SCHEDULE

		Lectures		Tutorial
Wk		**MON (9 – 10)**	**MON (10– 11)**	**WED (12 – 1 or 1 - 2)**
1	23/7	**Foundations: Introduction to nervous system function**		
		Neurons and Glia [Moalem-Taylor]	Structure & Function [Moalem-Taylor]	Role of glia in pathological conditions
2	30/7	**Foundations: Neural communication**		
		Synaptic Transmission [Power]	Simple Neuronal Networks [Power]	Dissecting Neural circuits [Power]
3	6/8	**Sensory systems: Touch and pain 1**		
		Neural Coding [Vickery]	Neural Coding [Vickery]	Peripheral Tactile [Vickery]
4	13/8	**Sensory systems: Touch and pain 2**		
		Central Tactile [Vickery]	Introduction to Pain [Moalem-Taylor]	Pain tutorial [Moalem-Taylor]
5	20/8	**Sensory systems: Hearing**		
		Introduction to Hearing: the Cochlea [Housley]	Central Auditory Pathways [Housley]	Cochlear Pathophysiology [Housley]
6	27/8	**Sensory systems: Proprioception**		
		Kinaesthesia I [Héroux]	Kinaesthesia II [Héroux]	Kinaesthesia [Héroux]
7	03/9	**Memory Systems**		
		Practice exam	Memory Systems [Power]	Designing an experiment [Power]
8	10/9	**Exam**		
		Midterm-exam	No lecture	Exam review [Power]
9	17/9	**Higher order processing: Plasticity and Motivation**		
		Memory & Synaptic Plasticity [Power]	Motivated learning [Power]	Making memories [Power]
BREAK				
11	08/10	**NS dysfunction**		
		Peripheral Neuropathy [Trinh]	Addiction [Power]	NS dysfunction [TBD]
12	15/10	**Autonomic Systems**		
		ANS [Kumar]	Hypothalamic Regulation of Autonomic Function [Carrive]	ANS tutorial [Kumar]
13	22/10	**Future Therapies**		
		Neuro-prosthetics [Vickery]	Gene therapy [von Jonquieres]	Neural Prosthetics [TBD]

Prac Schedule

wk	date	Prac (Mon 11-2 or 3-6)
1	23/7	NO PRAC
2	30/7	Swimmy part 1 [Power] (WW G16/17 or G08)
3	6/8	Swimmy part 2 [Power] (WW G16/17 or G08)
4	13/8	Tactile Psychophysics [Vickery] (WW 120)
5	20/8	Cockroach Nerve [Vickery] (WW 120)
6	27/8	Auditory Prac [Housley] (WW 120)
7	3/9	Kinaesthesia [Héroux] (WW 120)
8	10/9	Simulating the Nervous system [Kario] (WW 120)
9	17/9	DIY prac planning [Power] (WW 120)
		BREAK
11	8/10	DIY 1: Execution and Troubleshooting (WW 120)
12	15/10	DIY 2: Execution and analysis (WW 120)
13	22/10	DIY 3: Analysis and presentation(WW 120)

ASSESSMENT TASKS

Task	Due Date
Pre lab quizzes (7 x)	Mondays weeks 2-8
Midterm Exam	10 September
Final Exam	TBD
Student Designed Prac (Topic and Group Agreement)	12 September
Student Designed Prac (Proposal including RA and SWP)	21 September
Student Designed Prac (Group Report)	25 October
Student Designed Prac (Reflection and Peer Review)	26 October