# PSYC3914 – Behavioural & Cognitive Neuroscience Adv

## Unit of Study Outline

**Unit of Study Code:** PSYC3914  
**Coordinator:** A/Prof Thomas Carlson  
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Consultation times: by appointment

**Other Lecturing Staff:**  
Dr Irina Harris  
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Consultation times: by appointment

**Tutor:** A/Prof Thomas Carlson (details above)

**Format of Unit:**  
2 x 1 hour lectures/week x 13 weeks  
1 x 2 hour tutorial/week x 10 weeks

**Credit Point Value:** 6 Credit Points

**Prerequisite:**  
1. PSYC (2010/2910 or 2011/2911 or 2111) and at least one other Intermediate Psychology Unit from PSYC (2012 or 2112), PSYC (2013 or 2113), PSYC (2014 or 2114). OR  
2. (PSYC2010/2910 or 2011/2911 or 2111 or 2013) and ANAT2010 and PCOL2011.

**Textbook:** There is no set textbook for this course, but the following are recommended and are available in the library, as either 2 hour loans or e-books:

• Nolte’s The Human Brain: An introduction to its functional anatomy (Authors: Vanderah, T.W. & Gould, D.J.), 7th edition, Elsevier, 2016. (available as e-book through the library; note also that there are earlier editions of this book, authored by Nolte).
• The Wickens textbook that some of you will have from PSYC2011 also has material covered in this course, albeit at a more introductory level.

<table>
<thead>
<tr>
<th>PSYC3014 Assessment Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What?</strong></td>
</tr>
<tr>
<td>Assignment (2000 word Report) Based on experiment discussed and run in tutorials</td>
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<tr>
<td>Tutorial Quiz 1</td>
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<tr>
<td>Non-compulsory</td>
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<tr>
<td>Tutorial Quiz 2</td>
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<tr>
<td>Non-compulsory</td>
</tr>
<tr>
<td>Class Participation</td>
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<tr>
<td>Non-compulsory</td>
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<tr>
<td>Exam</td>
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<tr>
<td>Compulsory*</td>
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<tr>
<td><strong>Total</strong></td>
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</tbody>
</table>

*Completion of these components is compulsory to pass this unit. Students who fail to do so will receive an Absent Fail, regardless of their marks in other assessments.

**Further information about assessments**

**Report Assignment**: One 2000 word report (30% of total mark) due on Tuesday 3rd October (Week 9). The report is based on an experiment we will run in tutorials in Week 4. The idea behind this experiment will be explained in the tutorials in Week 2 and you will need to do some preparation for running the experiment in Week 4.
Week 4. If you are unable to attend your regular tutorial in those weeks, please arrange to do a different tutorial so you can participate in the experiment.

Students who do not complete the research report by the closing date must submit an alternative piece of written work to avoid automatically failing the course. If this is considered a serious effort, they will receive 0 marks for this. A serious effort consists of writing at least 1000 words, and answering the assigned question. Non-serious efforts won’t be accepted.

**Tutorial Quizzes (x2):** Held in tutorials (Week 6 and Week 12) assessing the tutorial material not covered in the report. Each quiz is worth 7.5%. If you are unable to attend your regular tutorial, make arrangements to attend a different tutorial in those weeks to sit the quiz. The quizzes are not compulsory, and there is no alternative assessment. If you miss a quiz and have received special consideration, this will result in a re-weighting of your other marks. If you miss a quiz and do not have special consideration, you will simply forgo 7.5 marks.

**Participation:** Participation in class discussions throughout the semester (5%). We will also have a bigger discussion forum in Week 12 on a topic to be advised, for an additional opportunity to pick up marks.

**Examination**[50% of total mark): This will be a combination of multiple-choice questions and short answer questions. The exam assesses your knowledge of materials covered in lectures and readings set by the lecturing staff.

*Completion of these components is compulsory to pass this unit. Students who fail to do so will receive an Absent Fail, regardless of their marks in other assessments.

**Late penalties**

You will receive a penalty of 2% of the maximum value of the Report Assignment (e.g. 2 marks / 100) for each day (or part thereof) it is late, up to the closing date of the assignment, after which no more submissions will be accepted. For the Report Assignment, a successful Special Consideration application will result in a reduction in late penalties only (i.e., no other mark adjustment is possible). If you are so badly affected that you are unable to submit the assignment before the closing date, you are advised to use your documentation to apply for discontinue not fail (DC) from this course from the Faculty of Science.

**Disruptions to your study**

The university does not permit informal special consideration. If you experience any disruption to your study due to illness, misadventure, or other unavoidable factors, you must apply for formal Special Consideration online at [http://sydney.edu.au/current_students/special_consideration/index.shtml](http://sydney.edu.au/current_students/special_consideration/index.shtml). All Special Consideration requests are processed centrally and you will be required to provide supporting information which will be checked with the professional practitioner’s office. Keep copies of all paperwork.

If you have, or develop, an ongoing medical issue, you can register with Disabilities Services [www.sydney.edu.au/disability](http://www.sydney.edu.au/disability).

In this unit of study Simple Extensions are not granted. Apply formally for special consideration using the link above if you require any extension.

Students who miss or cannot complete the final exam through illness or misadventure will be offered a different supplementary exam as a replacement. Note that students who apply for and are granted either
special arrangements or special consideration for examinations in units offered by the Faculty of Science will be expected to sit any replacement assessments in the two weeks immediately following the end of the formal examination period. Later dates for replacement assessments may be considered where the application is supported by appropriate documentation and provided that adequate resources are available to accommodate any later date. We reserve the right to offer supplementary examinations in different formats to the original examination.

**Academic Honesty**

While the University is aware that the vast majority of students and staff act ethically and honestly, it is opposed to and will not tolerate academic dishonesty or plagiarism and will treat all allegations of dishonesty seriously.

All students are expected to be familiar and act in compliance with the relevant University policies, procedures and codes, which include:

- Academic Honesty in Coursework Policy 2015
- Academic Honesty Procedures 2016
- Code of Conduct for Students
- Research Code of Conduct 2013 (for honours and postgraduate dissertation units)

They can be accessed via the University’s Policy Register: [http://sydney.edu.au/policies](http://sydney.edu.au/policies) (enter “Academic Honesty” in the search field).

Students should never use document-sharing sites and should be extremely wary of using online “tutor” services. Further information on academic honesty and the resources available to all students can be found on the Academic Integrity page of the University website: [http://sydney.edu.au/elearning/student/EI/index.shtml](http://sydney.edu.au/elearning/student/EI/index.shtml)

**Academic Dishonesty and Plagiarism**

**Academic dishonesty involves seeking unfair academic advantage or helping another student to do so.**

You may be found to have engaged in academic dishonesty if you:

- Resubmit (or “recycle”) work that you have already submitted for assessment in the same unit or in a different unit or previous attempt;
- Use assignment answers hosted on the internet, including those uploaded to document sharing websites by other students.
- Have someone else complete part or all of an assignment for you, or do this for another student.
- Except for legitimate group work purposes, providing assignment questions and answers to other students directly or through social media platforms or document (“notes”) sharing websites, including essays and written reports.
- Engage in examination misconduct, including using cheat notes or unapproved electronic devices (e.g., smartphones), copying from other students, discussing an exam with another person while it is in progress, or removing confidential examination papers from the examination venue.
- Engage in dishonest plagiarism.

**Plagiarism means presenting another person’s work as if it is your own without properly or adequately referencing the original source of the work.**
Plagiarism is using someone else’s ideas, words, formulas, methods, evidence, programming code, images, artworks, or musical creations without proper acknowledgement. If you use someone’s actual words you must use quotation marks as well as an appropriate reference. If you use someone’s ideas, formulas, methods, evidence, tables or images you must use a reference. You must not present someone’s artistic work, musical creation, programming code or any other form of intellectual property as your own. If referring to any of these, you must always present them as the work of their creator and reference in an appropriate way.

Plagiarism is always unacceptable, regardless of whether it is done intentionally or not. It is considered dishonest if done knowingly, with intent to deceive or if a reasonable person can see that the assignment contains more work copied from other sources than the student’s original work. The University understands that not all plagiarism is dishonest and provides students with opportunities to improve their academic writing, including their understanding of scholarly citation and referencing practices.

Use of similarity detection software

All written assignments submitted in this unit of study will be submitted to the similarity detecting software program known as Turnitin. Turnitin searches for matches between text in your written assessment task and text sourced from the Internet, published works and assignments that have previously been submitted to Turnitin for analysis.

There will always be some degree of text-matching when using Turnitin. Text-matching may occur in use of direct quotations, technical terms and phrases, or the listing of bibliographic material. This does not mean you will automatically be accused of academic dishonesty or plagiarism, although Turnitin reports may be used as evidence in academic dishonesty and plagiarism decision-making processes.

Where to get more information?

This Unit of Study Outline should be read in conjunction with the Undergraduate Student Guide which contains general administrative guidelines – available on the e-Learning site as well as on the School of Psychology website under Current Students > 2nd and 3rd Year: http://sydney.edu.au/science/psychology/current_students/doc/Psych_UG_Student_Guide.pdf

It is your responsibility to ensure that you are familiar with and adhere to the Student Guide. You should also check the e-Learning site for this course regularly for any announcements and resources related to lectures and tutorials. Academic and administrative staff will not answer questions where the answer is readily available in these sources, so please make sure you read these first before contacting them with questions.

Unit of study general description

This unit of study will focus on approaches to studying neurosciences incorporating molecular, preclinical and clinical models of brain function. These biological models of brain function will be linked with behavioural, affective and cognitive function and dysfunction. The implications of focal cognitive deficits in neurological patients for models of normal cognitive function will also be explored. Specific topics to be covered will include: the neural basis of learning and memory, sensorimotor integration, neurodegenerative disease, language, visual and spatial cognition and praxis, as well as commonly used methods in the behavioural and cognitive neurosciences. In addition to lectures, a practical component will cover basic neuroanatomy and neuroscience methods and introduce students to experimental and case-study approaches to studying neurosciences.
Graduate qualities in Behavioural and Cognitive Neuroscience
This course is structured around the graduate qualities associated with the scientist-practitioner model, the basis for the training of psychologists in Australia and internationally. Graduate Qualities are the generic skills, abilities and qualities that students should acquire during their university experience and the School of Psychology is committed to providing an environment to promote these skills. In addition, this unit of study will provide students with generalised and transferable skills that will also be useful in careers outside psychology.

The following graduate qualities and student learning outcomes will be developed through lectures, practical classes and assessment activities. They will be assessed in the laboratory report, tutorial quizzes, class participation and final exam.

1: Depth of disciplinary expertise in behavioural neuroscience and cognitive neuroscience
Display basic knowledge and understanding of major concepts, theoretical perspectives, empirical findings, and historical trends in behavioural and cognitive neuroscience

*Student learning outcomes:*
(i) An interest in and appreciation of the historical and current contribution of learning theorists, neuroscientists, psychopharmacologists, cognitive and sensory scientists to the understanding of the brain and behaviour and to the treatment of mental illness and neurological disorders.
(ii) Understanding modern neuroscientific methods for measuring brain activity.
(iii) Understanding basic neural processes and anatomical systems underlying different types of learning and memory.
(iv) Understanding the neural control of movement and its disorders.
(v) Understanding the clinical presentation and biological bases of dementia.
(vi) Understanding the neural systems underlying object perception and its disorders.
(vii) Understanding neural systems underlying speech and language and its disorders.
(viii) Understanding neural systems underlying attention and its disorders.
(ix) Understanding of concepts of neural computation.
(x) Understanding neural correlates of sleep and wakefulness.
(xi) Ability to describe, explain and evaluate research studies in these fields.
(xii) Skill in reporting experimental work using standard conventions.

2: Research Methods in behavioural and cognitive neuroscience
Understand, apply and evaluate basic research methods in behavioural and cognitive neuroscience, including design of laboratory and clinical research, data collection, analysis and interpretation, literature searches and review. Demonstrate understanding of technologies used to study brain function and activity.

*Student learning outcomes:*
(i) To develop a critical understanding of the major methods of research in these areas.
(ii) To critically assess the major theories and research findings in these areas.
(iii) To interpret statistical analyses.
(iv) Use basic web-search, word-processing, database, spreadsheet, and data analysis programs.
(v) Design and conduct basic studies to address psychological questions: frame research questions; undertake literature searches; critically analyse theoretical and empirical studies; formulate testable hypotheses; operationalise variables; choose an appropriate methodology; make valid and reliable measurements; analyse data and interpret results; and write research reports.

3: Critical Thinking Skills in behavioural and cognitive neuroscience
Respect and use critical and creative thinking, skeptical inquiry, and the scientific approach to solve problems related to the neuroscientific bases of behaviour. Develop ability to identify and evaluate the purposes, research questions, data, perspectives, inferences, concepts, implications and assumptions associated with research presented during the course.

**Student learning outcomes:**
(i) Demonstrate an attitude of critical thinking that includes persistence, open-mindedness, and intellectual engagement.
(ii) Evaluate the quality of information, including differentiating empirical evidence from speculation.
(iii) Evaluate issues and behaviour using different theoretical and methodological approaches.
(iv) Use reasoning and evidence to recognise, develop, defend, and criticise arguments and persuasive appeals.

4: Values in behavioural and cognitive neuroscience

**Student learning outcomes:**
(i) Value empirical evidence; tolerate ambiguity during the search for greater understanding of behaviour and knowledge structures
(ii) Use information in an ethical manner (e.g., acknowledge and respect the work and intellectual property rights of others through appropriate citations in oral and written communication)
(iii) Be able to recognise and promote ethical practice in research.
(iv) Promote evidence-based approaches and rigour in the understanding of behaviour.
(v) Be aware of ethical issues pertaining to clinical interventions.
(iv) Respect diversity associated with cognitive and neurological disorders.

5: Communication Skills in behavioural and cognitive neuroscience

**Student learning outcomes:**
(i) Write a standard research report using American Psychological Association (APA) structure and formatting conventions.
(ii) Write effectively in a variety of other formats (e.g., essays, research proposals, reports) and for a variety of purposes (e.g., informing, arguing).
(iii) Demonstrate effective oral communication skills in various formats (e.g., debate, group discussion, presentation) and for various purposes.
(iv) Collaborate effectively, demonstrating an ability to: work with groups to complete projects within reasonable timeframes; manage conflicts appropriately and ethically.

6: Learning and the application of behavioural and cognitive neuroscience

**Student learning outcomes:**
(i) To develop an awareness of the applications of the theories and research findings in learning, control of movement, memory, language, visual processing, computational modeling and sleep.
(ii) Apply psychological concepts, theories, and research findings to solve problems in everyday life and in society.
(iii) Understand major areas of applied psychology and neuroscience.
(iv) Understand how basic research in psychopharmacology and neuroscience gives rise to treatments for addictions, movement and memory disorders and other neurological disorders.
(v) Develop a capacity for independent learning that will sustain personal and professional development in the rapidly changing field of neuroscience.
(vi) self-assess performance accurately; incorporate feedback for improved performance; purposefully evaluate the quality of one’s thinking (metacognition, part of critical thinking).
### LECTURE AND TUTORIAL TIMETABLE

Lectures are held on:
- Mondays 11-12 in Physics Lecture Theatre 1 (Rm 405)
- Thursdays 11-12 in Quadrangle Building, General Lecture Theatre K2.05

All tutorials are in Old Teachers College, Room 324

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture #</th>
<th>Topic</th>
<th>Lecturer</th>
<th>Tutorial (2 hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 July</td>
<td>1</td>
<td>Introduction and History of Neuroscience</td>
<td>IH</td>
<td>No tutorials</td>
</tr>
<tr>
<td>Week 1</td>
<td>2</td>
<td>Measuring the brain: Direct approaches</td>
<td>TC</td>
<td></td>
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<tr>
<td>7 Aug</td>
<td>3</td>
<td>Measuring the brain: Indirect approaches</td>
<td>TC</td>
<td>Being a scientist + Introduction to reproducible research and MATLAB programming</td>
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<tr>
<td>Week 2</td>
<td>4</td>
<td>The brain as an information processing system</td>
<td>TC</td>
<td></td>
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<tr>
<td>14 Aug</td>
<td>5</td>
<td>Cortical Organization: Maps and Modules</td>
<td>TC</td>
<td>Neuroanatomy Lab (in the Anatomy lab, on Thursday 12-2pm or 2-4pm)</td>
</tr>
<tr>
<td>Week 3</td>
<td>6</td>
<td>Rhythms in the brain</td>
<td>TC</td>
<td></td>
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<tr>
<td>21 Aug</td>
<td>7</td>
<td>Sleep</td>
<td>TC</td>
<td>Functional Specialization + Discussion experiment for major assignment</td>
</tr>
<tr>
<td>Week 4</td>
<td>8</td>
<td>Long-term potentiation</td>
<td>JH</td>
<td></td>
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<tr>
<td>28 Aug</td>
<td>9</td>
<td>Neural basis of Pavlovian conditioning</td>
<td>JH</td>
<td>Neural coding: Exploring Representational spaces and testing models</td>
</tr>
<tr>
<td>Week 5</td>
<td>10</td>
<td>Spatial learning</td>
<td>JH</td>
<td></td>
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<tr>
<td>4 Sept</td>
<td>11</td>
<td>Movement and motor control I</td>
<td>JH</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>Week 6</td>
<td>12</td>
<td>Movement and motor control II</td>
<td>JH</td>
<td>+ TMS lab tour (JH)</td>
</tr>
<tr>
<td>11 Sept</td>
<td>13</td>
<td>Biological Bases of Dementias</td>
<td>JH</td>
<td>Lifespan, development, and cortical thickness</td>
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<tr>
<td>Week 7</td>
<td>14</td>
<td>Dementia: Clinical Syndromes</td>
<td>JH</td>
<td></td>
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<tr>
<td>18 Sep</td>
<td>15</td>
<td>Brains vs. Computers I</td>
<td>AH</td>
<td>Simulating li’l Brains (AH)</td>
</tr>
<tr>
<td>Week 8</td>
<td>16</td>
<td>Brains vs. Computers II</td>
<td>AH</td>
<td></td>
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<tr>
<td>26 Sep</td>
<td></td>
<td>Study Break</td>
<td></td>
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<tr>
<td>2 Oct</td>
<td></td>
<td>(Monday is a public holiday)</td>
<td></td>
<td>No tutorials</td>
</tr>
<tr>
<td>Week 9</td>
<td>17</td>
<td>High Level Visual Processing I</td>
<td>IH</td>
<td>Report due Tuesday of Week 9</td>
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<tr>
<td>9 Oct</td>
<td>18</td>
<td>High Level Visual Processing II</td>
<td>IH</td>
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<tr>
<td>Week 10</td>
<td>19</td>
<td>Episodic Memory I</td>
<td>IH</td>
<td>Brain oscillations and disturbances</td>
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<tr>
<td>16 Oct</td>
<td>20</td>
<td>Episodic Memory II</td>
<td>IH</td>
<td></td>
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<tr>
<td>Week 11</td>
<td>21</td>
<td>Semantic memory</td>
<td>IH</td>
<td>Neuropathologies and resting state brain activity</td>
</tr>
<tr>
<td>23 Oct</td>
<td>22</td>
<td>Language I</td>
<td>IH</td>
<td>Quiz 2 + Virtual Reality lab tour + course evaluation.</td>
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<tr>
<td>Week 12</td>
<td>23</td>
<td>Language II</td>
<td>IH</td>
<td></td>
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<tr>
<td>30 Oct</td>
<td>24</td>
<td>Attention and the parietal lobe I</td>
<td>AH</td>
<td>No tutorials</td>
</tr>
<tr>
<td>Week 13</td>
<td>25</td>
<td>Attention and the parietal lobe II</td>
<td>AH</td>
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<tr>
<td>6 Nov</td>
<td></td>
<td>Study Vacation</td>
<td></td>
<td>No classes</td>
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<tr>
<td>Week 14</td>
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<tr>
<td>13 Nov</td>
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<td>Exam Period</td>
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<td>No classes</td>
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<tr>
<td>Week 15</td>
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<td></td>
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<tr>
<td>20 Nov</td>
<td></td>
<td>Exam Period</td>
<td></td>
<td>No classes</td>
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<tr>
<td>Week 16</td>
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IH = Irina Harris, TC = Thomas Carlson, JH = Justin Harris, AH = Alex Holcombe