

Huron University College  
Department of Psychology

**Psychology 2750E – Theories and Methods of Cognitive Neuroscience  
Fall/Winter 2021-2022**

**1.0 Basic Course Information**

- 1.1 Course Number:** Psychology 2750E  
**1.2 Course Name:** Theories and Methods of Cognitive Neuroscience  
**1.3 Class Times and Location:** T/Th 11:30a – 1:30p  
**1.4 Prerequisite(s):** At least 60% in Psychology 1100E. Other introductory courses may be substituted with the permission of the Department  
**1.5 Antirequisite(s):** None

**1.6 Instructor Information:**

Instructor: Dr. Stephen Van Hedger  
Office: V118  
Office hours: Fridays 10:00a – 12:00p  
Email: svanhedg@uwo.ca

**2.0 Calendar Description**

This course introduces the major research domains within cognitive neuroscience (e.g., memory, language, attention). In addition to surveying core topic areas, this course places a particular emphasis on the theories, experimental designs, and research methodologies that cognitive neuroscientists use to understand the biological basis of cognition.

2 lecture hours, 2 laboratory hours

**3.0 Course Objectives**

By the end of the course students should have:

- Knowledge of the fundamental concepts in human cognitive neuroscience
- An extensive understanding of the research methodologies and paradigms used to study cognitive neuroscience
- Hands-on experience in programming a research project, visualizing data, and preparing a research report

**4.0 Course Methods**

This course has two components:

1. Lectures, which are designed to help students understand the core theories, topics, and methods used in cognitive neuroscience. Lecture style is interactive (containing several breaks

for questions and simple demonstrations of concepts), so please come prepared to participate. *Lectures will take place on Tuesdays.*

2. Labs, which are designed to give students hands-on experience as cognitive neuroscientists. The exact format of labs varies from week to week, but some general activities include (1) critical discussions of assigned papers, (2) participating in / reflecting on classic paradigms use to study brain-behaviour relationship, (3) interactive tutorials related to programming experiments, analyzing data, and visualizing results. *Labs will take place on Thursdays.*

## 5.0 Time and Technology Expectations

You should plan on spending between 8-10 hours per week on this course (~4 hours inside the classroom, ~4-6 hours outside of the classroom). The general breakdown of time expectations is printed below.

Content	Expected Time Commitment
Readings	2-3 hours/week
Lectures	2 hours/week
Lab	2 hours/week
Research Project	1-2 hours/week
Quizzes / Learning Reflections	1 hour/week

Throughout the course, you will also be learning basic programming skills. Term 1 focuses on learning the basics of JavaScript and jsPsych, which will enable you to design a web-browser-based experiment. Term 2 focuses on learning the basics of R, a statistical program for simulating, processing, analyzing, and/or visualizing data. As such, you will need to download some programs to successfully complete the lab tutorials and research project. *All software is free and open source.*

Term 1:

- **jsPsych** (<https://www.jspsych.org/>) – jsPsych is a JavaScript library for running behavioral experiments in a web browser. The library provides a flexible framework for building a wide range of laboratory-like experiments that can be run online. It can be downloaded from the URL and also from the OWL Site
- **Atom** (<https://atom.io/>) – Atom is a cross-platform, customizable text editor that will allow you to complete the lab tutorials / program your experiment with ease. It can be downloaded from the provided URL

Term 2

- **R** (<https://www.r-project.org/>) – R is R is a free software environment for statistical computing and graphics. It needs to be downloaded before RStudio. You can download it here (<https://cran.r-project.org/mirrors.html>) – simply choose a location that is closest to you.
- **RStudio** (<https://www.rstudio.com/>) – RStudio is an excellent integrated development environment (IDE) for writing, running, and visualizing code run in R. Simply put, it makes the process of conducting statistical analyses in R much more user-friendly.

## 6.0 Required Textbook

Gazzaniga, M.S., Ivry, R.B., & Magnun, G.R. (2019). Cognitive neuroscience: The biology of the mind. 5<sup>th</sup> Edition: W.W. Norton & Company Inc.

Physical copies of the textbook can be purchased at the Book Store at Western. An electronic version of the textbook can be purchased here:

<https://www.vitalsource.com/en-ca/products/cognitive-neuroscience-the-biology-of-the-mind-michael-gazzaniga-richard-b-v9780393667851?term=9780393667851>

*There will be additional required readings (e.g., journal articles) assigned throughout the course. They will be posted on OWL*

## 7.0 Evaluation

Assessment	Date	Weight
OWL Module Quizzes	Throughout Course	(2% each x 8) 16%
Midterm Exams	December and April Exam Periods	(16% each x 2) 32%
Research Project	Proposal: January 16 <sup>th</sup>	10%
	Final APA Report: April 3 <sup>rd</sup>	25%
Learning Reflections	Throughout Course	(2% each x 8) 16%

1. *OWL Quizzes (16%)*: For approximately every three weeks of material covered there will be a quiz to gauge comprehension of the material covered in lectures and the textbook. These quizzes contain both multiple-choice and short-answer questions. There are 8 OWL quizzes each worth 2% of the final grade.

2. *Midterms (32%)*: There are 2 midterm exams. Each midterm will be worth 16% each, for a total of 32% of the final grade for the course. Midterm tests may cover any and all material (lectures, readings, videos, activities, and discussion) covered during the term. Midterm tests will consist of multiple-choice, fill-in-the-blank, short-answer, and essay-style questions. More details will be provided on OWL in advance of each midterm.

3. *Research Project (35%)*. Students will design and execute a research project that is informed by theories and methods of cognitive neuroscience. You will complete this research project individually, using a “case study” design with yourself as the participant. In the first term, you will work in small groups (~5 students/group) to program an experiment that can be used for the research project. In the second term, you will carry out the experiment and learn how to process, analyze, and visualize the data. Although parts of the research project will be conducted in groups, you will submit the research proposal and final report individually. Information and guidelines for the Research Project will be posted on OWL.

5. *Critical Learning Reflections (16%)*. Students will complete 8 learning reflections throughout the course. Each reflection consists of two open-ended questions that require you to think about the course content in a broader context. Each reflection assignment will be posted to OWL at least one week in advance of the suggested due date.

## 8.0 Late Penalties, Extensions, and Make-up Tests

Quizzes and reflections related to Term 1 content may only be completed up until the last day of classes in Term 1 (December 9). Quizzes and reflections related to Term 2 content may only be completed up until the last day of Term 2 (April 1).

Students who require accommodation for a missed Midterm Test should follow the Senate guidelines for accommodation for a missed test:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

If accommodation is recommended, the accommodation will be in the form of a make-up test or alternative assignment at the discretion of the instructor.

Students who require extensions of the deadline dates for assignments related to the Research Project (i.e., the Term 1 proposal or the Term 2 final report) should discuss the nature of the accommodation and extension request with the instructor.

## 9.0 Huron Psychology Department Grading Policy

Students at Huron University College should consider a grade in the range from 70-74 to be evidence of satisfactory performance in a 2100-level Psychology course. Grades in the B+ (75-79) or A (80-89%) ranges will only be awarded for performance that is demonstrably superior to the second-year standard associated with the Major or Minor modules. A grade of A+ (90-100%) will only be awarded very rarely and only for work that is truly exceptional.

The Psychology Department follows Western's grading guidelines, which are as follows (see: [http://www.uwo.ca/univsec/pdf/academic\\_policies/general/grades\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/general/grades_undergrad.pdf))

Grade	Description
A+ (90-100)	One could scarcely expect better from a student at this level
A (80-89)	Superior work that is clearly above average
B (70-79)	Good work, meeting all requirements and eminently satisfactory
C (60-69)	Competent work, meeting all requirements
D (50-59)	Fair work, minimally acceptable
F (below 50)	Fail

## 10.0 Tentative Schedule

*Note: This schedule is tentative and subject to change based on progress*

### Term 1

Date	Topic	Readings	Tentative Lab Schedule	Assessment To-Dos
<b>Week 1</b> (Sept. 9)	Introduction	CN: Chapter 1	None (lecture will occur on Thursday on Week 1)	
<b>Week 2</b> (Sept. 14/16)	Synaptic Transmission	CN: Chapter 2, FD: p.1-12	<u>Discussion:</u> What are the dimensions for analyzing behaviour? <u>Research:</u> Introduce the research project	Learning Reflection
<b>Week 3</b> (Sept. 21/23)	Brain Structures	CN: Chapter 2, FD: p.12-17	<u>Discussion:</u> Mechanism and function <u>Research:</u> The basics of programming for psychologists	OWL Quiz
<b>Week 4</b> (Sept. 28/30)	Methods – I	CN: Chapter 3, FD: p.17-20	<u>Discussion:</u> Perspective in research <u>Research:</u> Programming an experiment - I	Learning Reflection
<b>Week 5</b> (Oct. 5/7)	Methods – II	CN: Chapter 3, FD: p.20-25	<u>Discussion:</u> Timescale in research <u>Research:</u> Programming an experiment - II	
<b>Week 6</b> (Oct. 12/14)	Hemispheric Specialization	CN: Chapter 4 Poldrack (2011)	<u>Discussion:</u> Reverse inference <u>Research:</u> Group programming - I	OWL Quiz
<b>Week 7</b> (Oct. 19/21)	The Senses	CN: Chapter 5 FD: p.32-40	<u>Discussion:</u> Mind-body debate <u>Research:</u> Group programming - II	Learning Reflection

<b>Week 8</b> (Oct. 26/28)	Perceptual Organization	CN: Chapter 5, Weilhammer et al. (2013)	<u>Discussion:</u> Bistable perception <u>Research:</u> Group programming - III	
<b>Week 9</b> (Nov. 2/4)	FALL READING WEEK			
<b>Week 10</b> (Nov. 9/11)	Object Recognition – I	CN: Chapter 6 Smith & Little (2018)	<u>Discussion:</u> Small “n” designs <u>Research:</u> Tips and tricks for troubleshooting your code	OWL Quiz
<b>Week 11</b> (Nov. 16/18)	Object Recognition – II	CN: Chapter 6 Norman et al. (2006)	<u>Discussion:</u> Mind reading from fMRI? <u>Research:</u> Group programming - IV	Learning Reflection
<b>Week 12</b> (Nov. 23/25)	Attention – I	CN: Chapter 7	<u>Discussion:</u> The dark side of attention <u>Research:</u> Group programming - V	
<b>Week 13</b> (Nov. 30/Dec. 2)	Attention – II	CN: Chapter 7	<i>Informal presentation of your experiments</i>	OWL Quiz
<b>Exam Period</b>	N/A	N/A	N/A	Midterm Exam

## Term 2

Date	Topic	Readings	Tentative Lab Schedule	Assessment To-Dos
<b>Week 1</b> (Jan. 4/6)	Motor Structures	CN: Chapter 8	<u>Research:</u> Group programming wrap-up	Learning Reflection
<b>Week 2</b> (Jan. 11/13)	Perception/Action Links	CN: Chapter 8	<u>Research:</u> Project proposal Q&A	<b>Project Proposal</b>
<b>Week 3</b> (Jan. 18/20)	Memory	CN: Chapter 9	<u>Research:</u> Demo of implicit and explicit memory	OWL Quiz
<b>Week 4</b> (Jan. 25/27)	Sleep Consolidation	CN: Chapter 9, Nusbaum et al. (2017)	<u>Discussion:</u> Can sleep help you learn new skills?	Learning Reflection

<b>Week 5</b> (Feb. 1/3)	Introduction to Emotion	CN: Chapter 10		
<b>Week 6</b> (Feb. 8/10)	Emotion and Cognitive Processes	CN: Chapter 10	<u>Research:</u> Introduction to R	OWL Quiz
<b>Week 7</b> (Feb. 15/17)	SPRING READING WEEK			
<b>Week 8</b> (Feb. 22/24)	Introduction to Language	CN: Chapter 11 FD: p.25-32	<u>Discussion:</u> Nature-nurture in language acquisition <u>Research:</u> Basics of data processing in R	Learning Reflection
<b>Week 9</b> (Mar. 1/3)	Neural Models of Language	CN: Chapter 11 Batterink & Paller (2017)	<u>Discussion:</u> Neural entrainment to language <u>Research:</u> Introduction to bootstrapping	
<b>Week 10</b> (Mar. 8/10)	Cognitive Control	CN: Chapter 12	<u>Research:</u> Performing a bootstrap in R	OWL Quiz
<b>Week 11</b> (Mar. 15/17)	Introduction to Social Neuroscience	CN: Chapter 13, Zaki & Ochsner (2012)	<u>Discussion:</u> The neuroscience of empathy <u>Research:</u> Visualizing data - I	Learning Reflection
<b>Week 12</b> (Mar. 22/24)	Networks of Social Cognition	CN: Chapter 13	<u>Research:</u> Visualizing data - II	
<b>Week 13</b> (Mar. 29/31)	Consciousness	CN: Chapter 14, Livni (2018)	<u>Discussion:</u> Are plants conscious? <u>Research:</u> Q&A for final APA report	OWL Quiz <b>Final APA Report</b>
<b>Exam Period</b>				Midterm Exam

CN: Cognitive neuroscience: The biology of the mind (Gazzaniga et al.)

FD: Solving psychological problems in four dimensions (Goldin-Meadow et al.)

## **Appendix to Course Outlines: Academic Policies & Regulations 2021 - 2022**

### **Prerequisite and Antirequisite Information**

Students are responsible for ensuring that they have successfully completed all course prerequisites and that they have not completed any course antirequisites. Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

### **Pandemic Contingency**

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, typically using a combination of synchronous instruction (i.e., at the times indicated in the timetable) and asynchronous material (e.g., posted on OWL for students to view at their convenience). Any remaining assessments will also be conducted online at the discretion of the course instructor. In the unlikely event that changes to the grading scheme are necessary, these changes will be clearly communicated as soon as possible.

### **Student Code of Conduct**

Membership in the community of Huron University College and Western University implies acceptance by every student of the principle of respect for the rights, responsibilities, dignity and well-being of others and a readiness to support an environment conducive to the intellectual and personal growth of all who study, work and live within it. Upon registration, students assume the responsibilities that such registration entails. While in the physical or online classroom, students are expected to behave in a manner that supports the learning environment of others. Please review the Student Code of Conduct at: <https://huronatwestern.ca/sites/default/files/Res%20Life/Student%20Code%20of%20Conduct%20-%20Revised%20September%202019.pdf>.

### **Attendance Regulations for Examinations**

A student is entitled to be examined in courses in which registration is maintained, subject to the following limitations:

- 1) A student may be debarred from writing the final examination for failure to maintain satisfactory academic standing throughout the year.
- 2) Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course will be reported to the Dean of the Faculty offering the course (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean of that Faculty, the student will be debarred from taking the regular examination in the course. The Dean of the Faculty offering the course will communicate that decision to the Dean of the Faculty of registration.

Review the policy on Attendance Regulations for Examinations here:  
[https://www.uwo.ca/univsec/pdf/academic\\_policies/exam/attendance.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/exam/attendance.pdf).

### **Statement on Academic Offences**

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:  
[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf). The appeals process is also outlined in this policy as well as more generally at the following website:  
[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/appealsundergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/appealsundergrad.pdf).

### **Turnitin.com**

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

### **Statement on Use of Electronic Devices**

It is not appropriate to use electronic devices (such as, but not limited to, laptops, cell phones) in the classroom for non-classroom activities. Such activity is disruptive and distracting to other students and to the instructor, and can inhibit learning. Students are expected to respect the classroom environment and to refrain from inappropriate use of technology and other electronic devices in class.

### **Statement on Use of Personal Response Systems (“Clickers”)**

Personal Response Systems (“clickers”) may be used in some classes. If clickers are to be used in a class, it is the responsibility of the student to ensure that the device is activated and functional. Students must see their instructor if they have any concerns about whether the clicker is malfunctioning. Students must use only their own clicker. If clicker records are used to compute a portion of the course grade:

- the use of somebody else’s clicker in class constitutes a scholastic offence
- the possession of a clicker belonging to another student will be interpreted as an attempt to commit a scholastic offence.

### **Academic Consideration for Missed Work**

Students who are seeking academic consideration for missed work during the semester may submit a self-reported absence form online provided that the absence is **48 hours or less** and the other conditions specified in the Senate policy at [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf) are met.

Students whose absences are expected to last **longer than 48 hours**, or where the other conditions detailed in the policy are not met (e.g., work is worth more than 30% of the final grade, the student has already used 2 self-reported absences, the absence is during the final exam period), may receive academic consideration by submitting a Student Medical Certificate (for illness) or other appropriate documentation (for compassionate grounds). The Student Medical Certificate is available online at [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf).

All students pursuing academic consideration, regardless of type, must contact their instructors no less than 24 hours following the end of the period of absence to clarify how they will be expected to fulfill the academic responsibilities missed during their absence. **Students are reminded that they should consider carefully the implications of postponing tests or midterm exams or delaying submission of work, and are encouraged to make appropriate decisions based on their specific circumstances.**

Students who have conditions for which academic accommodation is appropriate, such as disabilities or ongoing or chronic health conditions, should work with Accessible Education Services to determine appropriate forms of accommodation. Further details concerning policies and procedures may be found at: <http://academicsupport.uwo.ca/>.

### **Policy on Academic Consideration for a Medical/ Non-Medical Absence**

#### **(a) Consideration on Medical Grounds for assignments worth *less than 10%* of final grade: Consult Instructor Directly and Contact Academic Advising**

When seeking consideration on **medical grounds** for assignments worth *less than 10%* of the final course grade, and if the student has exceeded the maximum number of permissible Self-Reported absences, the student should contact the instructor directly. The student need only share broad outlines of the medical situation. The instructor **may** require the student to submit documentation to the academic advisors, in which case she or he will advise the student and inform the academic advisors to expect documentation. If documentation is requested, the student will need to complete and submit the [Student Medical Certificate](#). The instructor may **not** collect medical documentation. The advisors will contact the instructor when the medical documentation is received, and will outline the severity and duration of the medical challenge as expressed on the Student Medical Certificate and in any other supporting documentation. The student will be informed that the instructor has been notified of the presence of medical documentation, and will be instructed to work as quickly as possible with the instructor on an agreement for accommodation.

#### **(b) Consideration on Non-Medical Grounds: Consult Huron Support Services/Academic Advising, or email [huronsss@uwo.ca](mailto:huronsss@uwo.ca).**

Students seeking academic consideration for a **non-medical** absence (e.g. varsity sports, religious, compassionate, or bereavement) will be required to provide appropriate documentation where the conditions for a Self-Reported Absence have not been met, including where the student has exceeded the maximum number of permissible Self-Reported. All consideration requests must include a completed [Consideration Request Form](#). Late penalties may apply at the discretion of the instructor.

Please review the full policy on Academic Consideration for medical and non-medical absence at: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf). Consult [Huron Academic Advising](#) at [huronsss@uwo.ca](mailto:huronsss@uwo.ca) for any further questions or information.

### **Support Services**

For advice on course selections, degree requirements, and for assistance with requests for medical accommodation, students should email an Academic Advisor in Huron's Student Support Services at [huronsss@uwo.ca](mailto:huronsss@uwo.ca). An outline of the range of services offered is found on the Huron website at: <https://huronatwestern.ca/student-life/student-services/>.

Department Chairs, Program Directors and Coordinators are also able to answer questions about individual programs. Contact information can be found on the Huron website at:

<https://huronatwestern.ca/contact/faculty-staff-directory/>.

If you think that you are too far behind to catch up or that your workload is not manageable, you should consult your Academic Advisor. If you are considering reducing your workload by dropping one or more courses, this must be done by the appropriate deadlines. Please refer to the Advising website,

<https://huronatwestern.ca/student-life/student-services/academic-advising/> or review the list of official Sessional Dates on the Academic Calendar, available here:

<http://www.westerncalendar.uwo.ca/SessionalDates.cfm>.

You should consult with the course instructor and the Academic Advisor who can help you consider alternatives to dropping one or more courses. Note that dropping a course may affect OSAP and/or Scholarship/Bursary eligibility.

Huron Student Support Services: <https://huronatwestern.ca/student-life/student-services/>

Office of the Registrar: <https://registrar.uwo.ca/>

Student Quick Reference Guide: <https://huronatwestern.ca/student-life/student-services/#1>

Academic Support & Engagement: <http://academicsupport.uwo.ca/>

Huron University College Student Council: <https://huronatwestern.ca/student-life/beyond-classroom/hucsc/>

Western USC: <http://westernusc.ca/your-services/#studentservices>

### **Mental Health & Wellness Support at Huron and Western**

University students may encounter setbacks from time to time that can impact academic performance. Huron offers a variety of services that are here to support your success and wellbeing. Please visit <https://huronatwestern.ca/student-life-campus/student-services/wellness-safety> for more information or contact staff directly:

Wellness Services: [huronwellness@huron.uwo.ca](mailto:huronwellness@huron.uwo.ca)

Community Safety Office: [safety@huron.uwo.ca](mailto:safety@huron.uwo.ca)

Chaplaincy: [gthorne@huron.uwo.ca](mailto:gthorne@huron.uwo.ca)

Additional supports for Health and Wellness may be found and accessed at Western through,

<https://www.uwo.ca/health/>.