

PSYC 370 – BEHAVIOURAL NEUROSCIENCE 1

COURSE ESSENTIALS

When: Tuesday & Thursday 9:30 – 10:50am

Where: Buchanan A203

Instructor: Jason Snyder

jasonsnyder@psych.ubc.ca

UBC Hospital, Koerner Pavilion F128

--directions: enter from the main entrance on Wesbrook Mall, veer right (north) when you pass the waiting area chairs, continue down the hallway ~25 meters and on your left you will see the elevator. Take it to level 1 (which is 1 floor above ground level) and text me when you are there, by the secure doors, and I will let you in.

Office hours: flexible and by appointment, or chat after class

--email is preferred for scheduling appointments

--in person is preferred for discussing course content

TA: Alyssa Ash

alyssa.ash@alumni.ubc.ca

Office hours: by appointment

Website: See Canvas website - Here I will post lecture outlines, the course schedule and any updates or changes, grades, supplementary links and readings. Check regularly.

Textbooks: Selected readings will be provided (for free) from: Kandel, E.R. et al. (2012), Principles of Neural Science, 5th Edition.

The course assumes a biopsychology background. However, if you have a background in science or psychology and are willing to put in the effort you will do well.

Lecture slides will be published online before class, may change at the last minute, and may be updated after class if content was added / fixed / clarified during class (i.e. always check before a test that you have the latest content).

No phones in class (it is distracting for me, for you, for others).

Please arrive on time (ditto)

Feel free AT ANY POINT to ask questions, add to the discussion, tell me I have food stuck in my teeth, etc.

GOALS

By the end of this course I hope that you will understand the neurobiology of many of your everyday experiences. Mainly because this will totally impress your friends at parties. More specific goals of PSYC 370 are that:

- 1) You will appreciate that neurons and circuits are the foundational units of brain function, and you will know about classic and state of the art methods for studying them.
 - a. Visualizing neurons as anatomical building blocks
 - i. Golgi, dye injection, genetically-encoded fluorescent proteins, immunohistochemistry, electron microscopy, brain clearing
 - b. Neurons as physiologically functional building blocks
 - i. Action potentials conduct signals within neurons
 - ii. Synaptic transmission sends signals between neurons
 - c. Neurons cooperate to form circuits
 - i. Synaptic convergence/divergence, feedforward and feedback inhibition
 - ii. The stretch reflex: a simple circuit that regulates behavior

- 2) You will be able to identify shared and unique mechanisms by which various sensory stimuli are detected, converted to electrical signals and represented in the brain
 - a. Basic sensory anatomy and physiology explains many psychophysical phenomena
 - b. Visual, auditory/vestibular, somatosensory, chemical sensory systems
 - i. Specialized sensory organs convert external stimuli into action potentials (sensory transduction)
 - ii. Neurons have receptive fields that relate to their function
 - iii. The spectrum of sensory stimuli is organized according to neuroanatomical maps
 - iv. Simple sensory neural representations are processed to form complex representations

- 3) You will appreciate that different memory systems learn about complementary aspects of experience.
 - a. Sensory information merges in the hippocampus to form episodic memories of specific experiences
 - i. Lateral and medial entorhinal cortex neurons represent object and spatial information, respectively
 - ii. Hippocampal neurons represent details of experiences and, together, they form memories that can be used flexibly
 - b. Synapses undergo plasticity to store memories in circuits
 - i. LTP as a synaptic model of memory
 - ii. Early LTP, late LTP and linking memories
 - c. Hippocampal memories transform and are consolidated into semantic/gist/factual memories in the neocortex
 - i. Standard model vs Multiple Trace model of memory consolidation

d. The striatum forms habit-based memories (that can support or compete with hippocampal memories)

4) You will appreciate that memory guides future behaviors and is disrupted in many psychiatric conditions

- a. Memories allow for imagination of future experiences
- b. Memory generalization contributes to anxiety disorders
- c. Aging and Alzheimer's disease impacts specific aspects of episodic memory

In short, my hope is that by the end of the first term you will have a holistic picture of how sensory information enters the brain, is remembered as something meaningful, and used to guide behavior.

EVALUATION

Performance will be evaluated with a midterm exam, an end of term final exam, and 4 assignments given throughout the semester. Examples of test questions will be provided and reviewed in class, and the assignments will also serve to familiarize you with the general style and expectations of testing.

Exams (2 x 40%)

- each exam will be 80min (i.e. same duration as class, even if during the final exam period)
- exams will be weighted equally (each 40% of final grade)
- exams are based on the material covered in class
- exams will not be explicitly cumulative, though later material will build on material covered earlier in the course.
- exam format will be a combination of multiple choice questions, fill in the blank, and short answer questions
- If you miss an exam you must notify me within 24hrs. We will then schedule a makeup exam.

Assignments (4 x 5%)

- Assignments will be take home questions based on material covered in class and discussed in small groups
- By discussing in groups, and then collectively as a class, you will hopefully have a solid understanding of the concept in question. If not, you should have a good idea of what you need to study from the course materials in order to complete the assignment.
- Each assignment will be worth 5% of your final grade, for a total of 20%
- Late assignments will not be accepted; if you miss an assignment the value of the remaining assignments will be scaled up accordingly

Grades will be available online, may be scaled, and are not official until they appear on your final academic record.

The course TA will grade the exams and assignments, will be available to review them with you, and will resolve the majority of grading issues that may arise.

SCHEDULE

Sept. 5	Lecture 1: Course Intro
Sept. 10	Lecture 2: Neurons – anatomy and methods pt1
Sept. 12	Lecture 3: Neurons – anatomy and methods pt2
Sept. 17	Lecture 4: Membrane potential, action potential
Sept. 19	Lecture 5: Mem. Potential & Synaptic transmission
Sept. 24	Lecture 6: Synaptic transmission
Sept. 26	Lecture 7: Synaptic interactions & circuits
Oct. 1	Lecture 8: Visual System (retina)
Oct. 3	Lecture 9: Visual System (pathways & circuits)
Oct. 8	Lecture 10: Visual System (cortex)
Oct. 10	Lecture 11: Auditory System
Oct. 15	Lecture 12: Somatosensory & Olfactory Systems
Oct. 17	Midterm exam
Oct. 22	Class cancelled
Oct. 24	Lecture 13: Ventral Stream, Association Cortex
Oct. 29	Lecture 14: Dorsal Stream, Association Cortex
Oct. 31	Lecture 15: Entorhinal cortex, hippocampus & place cells pt1
Nov. 5	Lecture 16: Entorhinal cortex, hippocampus & place cells pt2
Nov. 7	Lecture 17: Synaptic plasticity & memory encoding pt1
Nov. 12	Lecture 18: Synaptic plasticity & memory encoding pt2
Nov. 14	Lecture 19: Adult neurogenesis
Nov. 19	Lecture 20: Memory consolidation
Nov. 21	Lecture 21: Memory and Disorders pt1
Nov. 26	Lecture 22: Memory and Disorders pt2
Nov. 28	Lecture 23: Wrapup & review
Dec. 3-18	December Exam Period

Psychology Department's Position on Academic Misconduct

Cheating, plagiarism, and other forms of academic misconduct are very serious concerns of the University, and the Department of Psychology has taken steps to alleviate them. In the first place, the Department has implemented software that can reliably detect cheating on multiple-choice exams by analyzing the patterns of students' responses. In addition, the Department subscribes to TurnItIn – a service designed to detect and deter plagiarism. All materials (term papers, lab reports, etc.) that students submit for grading will be scanned and compared to over 4.5 billion pages of content located on the Internet or in TurnItIn's own proprietary databases. The results of these comparisons are compiled into customized "Originality Reports" containing several sensitive measures of plagiarism; instructors receive copies of these reports for every student in their class. In all cases of suspected academic misconduct the parties involved will be pursued to the fullest extent dictated by the guidelines of the University. Strong evidence of cheating or plagiarism may result in a zero credit for the work in question. According to the University Act (section 61), the President of UBC has the right to impose harsher penalties including (but not limited to) a failing grade for the course, suspension from the University, cancellation of scholarships, or a notation added to a student's transcript. All graded work in this course, unless otherwise specified, is to be original work done independently by individuals. If you have any questions as to whether or not what you are doing is even a borderline case of academic misconduct, please consult your instructor. For details on pertinent University policies and procedures, please see Chapter 5 in the UBC Calendar (<http://students.ubc.ca/calendar>) and read the University's Policy 69 (available at <http://www.universitycounsel.ubc.ca/policies/policy69.html>).

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here: <https://senate.ubc.ca/policiesresources-support-student-success>