

This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 455 – Comparative Neurobiology

General Course Syllabus (as of November 2019)

About the Course:

Course Description: Current approaches in neurobiology, from the cellular to the behavioural level, are examined using representatives of vertebrate and invertebrate nervous systems. The course will examine how nervous systems function from the ground up – the molecular and cellular mechanisms underlying neuron function; how assemblies of neurons (neural circuits) process information and generate behaviour; and how complex nervous systems generate higher cognitive function. We will examine a wide variety of organisms ranging from invertebrates to vertebrates to try to understand how nature has shaped various solutions to common problems animals face in navigating through, reacting to, and ultimately surviving in their environment.

Course Format: Lecture

Credits: 3

Prerequisites: One of BIOL 361, BIOL 362, BIOL 364, CAPS 301, PSYC 360.

Course Learning Outcomes:

By the end of this course, students should be able to:

- Explain common mechanisms that underlie nervous system function.
- Compare the mechanisms and information coding principles underlying perception of the 5 senses.
- Provide examples of conservation, divergence, and specialization of function across species.
- Interpret data from common experimental approaches used to study nervous system function.
- Read and critically analyze scientific articles in the field.

Textbooks and Additional Resources:

There will be assigned reading from the textbook, as well as assigned articles from the scientific literature.

- **Required text:** Neuroscience, 6th edition. Purves et al, Sinauer publishers. 5th edition is also acceptable, but the page references for readings will not match.
- **Course Website:** Assigned readings, updates, lecture notes, schedule, etc. are posted on Canvas (canvas.ubc.ca).

Additional Required Resource: iClicker

Grading Scheme:

| Assessment | Weight |
|--------------------|-------------------------|
| Assignments | Up to 10% (optional) |
| iClicker questions | 10% |
| Midterm exam 1 | 20% |
| Midterm exam 2 | 20% |
| Final exam | 40% |

Assignments (~10 a term) consist of problem sets relevant to the week's lectures. iClickers are used periodically in class to test student understanding.

Schedule of Topics:

A sample schedule from 2019W1 is below:

| Week | Lecture Topic | Assignment due |
|------|---|----------------|
| 1 | Introduction to course and intro to neural circuits | |
| | Resting potentials and neuron equivalent circuit | #1 |
| 2 | Voltage clamp and action potentials | |
| | Ion channels and current/voltage relationships | #2 |
| | Ion channel families | |
| 3 | Paper discussion 1 – ion channels | |
| | Synaptic transmission | #3 |
| | Neurotransmitters and their receptors I | |
| 4 | Neurotransmitters and their receptors II | |
| | Tactile sensation I – molecular sensors | #4 |
| | Tactile sensation II – circuits and specialists | |
| 5 | Paper discussion 2 | |
| | Vision I – the retina | #5 |
| | Vision II – higher visual processing | |
| 6 | Midterm 1 (covers lectures 1-9 and paper discussions 1-2) | |
| | Audition I – the inner ear | |
| | Audition II – sound localization and specialists | |
| 7 | Holiday | |
| | Olfaction I – peripheral olfaction | #6 |
| | Olfaction II – central olfactory processing | |
| 8 | Taste I – peripheral taste detection | |
| | Taste II – behavior and central representations | #7 |
| | Pheromones and kairomones | |
| 9 | Paper discussion 3 | |
| | Motor systems and voluntary movement | #8 |
| | Motor planning and action selection | |

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|----|---|-----|
| 10 | Midterm #2 (covers lectures 10-22 and paper discussion 3) | |
| | Synaptic plasticity | |
| | Learning and memory | #9 |
| 11 | Holiday | |
| | Paper discussion 4 | |
| | Emotions and motivated behavior | |
| 12 | Circadian rhythms and sleep | |
| | Vocal communication and language | #10 |
| | Paper discussion 5 | |
| 13 | Brain dysfunction – neurodegenerative diseases | |
| | The future of neuroscience | |
| | Review period | |
| - | Final Exam (covers all lectures) | |

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, spiritual 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 on [the UBC Senate website](#).