

BIOLOGY 404 Sensory Biology Course Outline

Fall 2026 A01 CRN 10384

Department of Biology, University of Victoria

Course instructor:

Dr. Gautam Awatramani

Contact information:

gautam@uvic.ca Please include “BIOL 404” in the subject line

Time and Place:

Sept 09 – Dec 04, 2026

Tues, Wed, Fri

11:30am – 12:20 pm;

Cunningham Building (CUN) room 146

Office hours: by appointment

Course Description:

Sensory neurobiology explores how organisms perceive and interpret the world through specialized sensory systems. This course provides a comparative and mechanistic understanding of how external stimuli—light, sound, chemicals, touch, and temperature—are detected, transduced, and processed by the nervous system. Emphasis will be placed on the cellular, molecular, and systems-level principles that underlie sensory function, as well as how these computations give rise to perception and behavior. Both vertebrate and invertebrate models will be discussed, highlighting evolutionary conservation and diversity in sensory strategies.

Learning Outcomes:

By the end of the course, students will be able to:

1. Critically evaluate the primary literature
2. Describe the anatomical and molecular organization of major sensory systems (vision, audition, olfaction, gustation, somatosensation, vestibular).
3. Explain the biophysical principles underlying sensory transduction (e.g., phototransduction, mechanotransduction, chemoreception).
4. Evaluate how neural circuits process sensory input to extract relevant features.
5. Understand how sensory information is integrated across modalities to guide perception and behavior.
6. Analyze classical and modern experimental approaches in sensory neurobiology, including electrophysiology, imaging, genetics, and behavioral assays.
7. Discuss clinical and translational aspects of sensory neuroscience, including sensory disorders, prosthetics, and therapies.

Major Topics Covered

Introduction to Sensory Neurobiology, general principles of transduction and neural coding

- Audition and Vestibular Systems

Hair cell mechanotransduction

Tonotopy and auditory coding (sound localization)

Balance, orientation, and vestibular reflexes

- Olfaction and Gustation

Odorant receptors and olfactory coding

Taste receptor mechanisms and pathways

Neural representation of flavor and chemical cues

- Somatosensation and Pain

Mechanoreceptors and touch coding

Proprioception

Thermoreception and nociception

Plasticity and chronic pain mechanisms

- Vision

Photoreceptor physiology and phototransduction

Retinal circuits and feature detection

Central visual pathways and cortical processing

Textbook (suggested but not required):

Purves et al., (2015) Neuroscience. 6th edition.

Note: Previous editions would also be helpful

Course material:

Material such as course outline, class schedule, exam results and presentation lecture notes will be available on Brightspace (<http://bright.uvic.ca/> with your Netlink ID and password). ***Note that there will be no recorded lectures available.***

All course content and materials are made available by instructors for educational purposes and for the exclusive use of students registered in their class. The material is protected under copyright law, even if not marked with a ©. Any further use or distribution of materials to others requires the written permission of the instructor, except under fair dealing or another exception in the Copyright Act. Violations may result in disciplinary action under the Resolution of Non-Academic Misconduct Allegations policy (AC1300).

Prerequisites: Complete 1 of:

BIOL365 - Animal Physiology (1.5)

BIOL367 - Neurobiology: Molecules to Behaviour (1.5)

BIOL409A - Neurobiology: Molecules to Behaviour (1.5)

Course Format:

Lectures with integrated primary literature discussions. Friday lectures will focus on a single “discussion paper”, following the weekly quiz (see below)

The last two weeks will be dedicated to Student presentations aimed at synthesizing concepts across sensory modalities

Assessment:

Quizzes (30%): Every Friday

Midterm exam (25%): October 23rd

Research article presentation (10%): Last two weeks

End-term exam (35%): scheduled by Records

Quizzes:

- Each quiz will consist of ~5 multiple choice (M/C) questions
- Lecture material directly related to the paper to be discussed that day will be emphasized.
- The questions are designed to encourage a critical and thorough examination of the discussion paper
- The quizzes will be handed at the start of class (most Fridays) and students will be given 5-10 minutes to complete the quiz.
- Total of 9 quizzes

Midterm exam & Final Exams

- Mid-term test material will be presented up till mid-October.
- Questions will be taken from both the lectures and discussion papers.
- The exams will be mostly short answer questions with some matching, M/C and labeling of diagrams
- The Final exam will be comprehensive

Quizzes, Midterms and Final Exams will be done face-to-face for all students.

Student presentations

- Groups of ~2-4 students/ group will be assigned in class
- Presentations of a chosen paper should include the following sections: background/introduction, methods, results, discussion.
- Grade assigned based on individual and group presentation. A detailed rubric for grading will be posted on Brightspaces
- Papers must be chosen from one of three journals: Neuron, Cell Reports, and Nature Neuroscience.
- The article needs to be approved by the instructor. Presentation due NOV 13th
- Presentation material may be included in the final exam

Required course components:

- Students must receive 50% on the Quiz section to attempt the Final Exam
- Students must receive 50% on the Final Exam to pass the course

Academic concessions

- In agreement with UVic policy, an exam missed for a legitimate reason (illness, accident, family affliction; does not include weddings etc.) may be rescheduled.
- In the case of a missed quiz, a 2-page written report summarizing the discussion paper (including an Introduction, Methods, Results and Discussion section) submitted within two weeks of dates of absence (as per doctor's note), will be evaluated and marked by the instructor. AI cannot be used for assignments.
- The final exam can be deferred in cases of illness, accident, family affliction, or sporting commitments as a UVic athlete. If you miss or expect to miss the final exam for any of these reasons, please notify the instructor. You must also fill out a Request for Academic Concession form, available from the Records office, as soon as possible in order to have your request for deferral consideration.
- Travel plans are not a valid reason for missing the midterm test or the final exam.
- No supplemental final exam will be given on this course as per Biology Dept. policy.

Grading

- The final grade for the course will be submitted as a percentage grade (rounded to the nearest whole percent by our spreadsheet program).
- Please do not request raises in your grade, or extra-credit work to raise your grade. This would be unfair to you fellow students

Important registration and fee dates

- September 22, 2026: Last day for 100% reduction of tuition fees for standard first-term and full-year courses.
- October 13, 2026: Last day for 50% reduction of tuition fees for standard courses. Courses dropped after this date are assessed 100% of tuition fees.
- October 31, 2026: Last day to withdraw from first-term courses without penalty of failure.

Important dates:

Wednesday, September 30 – University closed (National Day for Truth and Reconciliation)

November 9–11 – Reading Break; no classes

Friday, December 4 – Last scheduled BIOL 404 class

December 10–23 – Final examination period

Academic regulations and policies:

Please read the appropriate section of the current UVic Academic Calendar regarding your rights and obligations. Students are to take note of the ADD/DROP dates published in the Calendar and posted on the Undergraduate Records website. **Students must not assume they will be dropped automatically from any course they do not attend.**

Academic Integrity <https://www.uvic.ca/students/academics/academic-integrity/index.php>

Students are required to abide by all academic regulations set as set out in the University calendar, including standards of academic integrity. Violations of academic integrity (e.g. cheating and plagiarism) are considered serious and may result in significant penalties.

Policy on Generative AI

- The thoughtful use of generative AI tools, including ChatGPT and other AI-assisted learning tools, is encouraged in this course for studying, clarifying concepts, generating practice questions, and exploring alternative explanations.
- However, generative AI **may not be used to write, rewrite, edit, or generate content for written assignments submitted for evaluation**. Written assignments must reflect the student's own analysis, interpretation, and writing.
- Students remain responsible for the accuracy and integrity of all work they submit. Any permitted use of AI must be consistent with UVic's expectations for academic integrity.

Student conduct:

The University of Victoria is committed to promoting critical academic discourse while providing a respectful and supportive learning environment. All members of the university community have the right to this experience and the responsibility to help create such an environment. The University will not tolerate racism, sexualized violence, or any form of discrimination, bullying or harassment. Please be advised that, by logging into UVic's learning systems or interacting with online resources, and course-related communication platforms, you are engaging in a university activity. All interactions within this environment are subject to the university expectations and policies.