Department of Biology Course Outline

SC/BIOL 3380 3.0 Sensory Systems
Fall, 2024
(version: Sept 01, 2024)

Course Description

This course explores sensory systems in humans, animals and machines, and how they control action, behavior and physiological state. Adopting a comparative approach, we focus on highly specialized sensory systems and unusual, often surprising solutions to sensory challenges.

Three lecture hours per week. One term. 3.0 credits.

Prerequisites (strictly enforced)

BIOL 3060 4.0 or PSYC 2220 3.0

Course Instructor(s) and Contact Information

Course Director:

Dr. Niko Troje, troje@yorku.ca

Department of Biology
Life Sciences Building,
Office: 429 B

Office Hours: By appointment

TA: tba

If you contact me by email, please include “BIOL 3380” in the subject line, and your full name and student number in the text of your email.

Schedule

Lectures: Tuesdays and Thursdays from 5:30pm – 7:00pm

Classes are applied synchronously, and attendance is required.

Contents and Schedule

Week	Topic	Assignment/Marks [%]	Reading
1 2	Introduction: Sept 9 – 20	**Poster** **30+10** Assignment due: Sept 27 Evaluation due: Oct 4	Foster, K. W., & Smyth, R. D. (1980) Light antennas in phototactic algae. *Microbiological reviews*, *44*(4), 572-630.
3 4	Light and eye Sept 23 – Oct 4		Dawkins, R. (1996) *Climbing mount improbable*. WW Norton & Company. Chapter 5: The forty-fold path to enlightenment.
5 6	Colour Oct 7 – 25 incl. reading week	**Research Proposal 30+10** Assignment due: Nov 1 Evaluation due: Nov 8	Stubbs, A. L., & Stubbs, C. W. (2016). Spectral discrimination in color blind animals via chromatic aberration and pupil shape. *PNAS*, 113(29), 8206-8211.
7 8	Hearing Oct 28 – Nov 8		Knudsen, E. I., & Konishi, M. (1979). Mechanisms of sound localization in the barn owl (Tyto alba). *Journal of Comparative Physiology*, *133*, 13-21.
9 10	Polarization vision Nov 11 – 22	**Conference Talk** **30+10** Assignment due: Nov 29 Evaluation due: Dec 6	Rossel, S., & Wehner, R. (1986). Polarization vision in bees. *Nature*, *323*(6084), 128-131.
11 12	Depth, distance, shape, Bayes Nov 25 – Dec 3	**Final Exam** **60** time: tba	TBD

Evaluation

Grading:	Final exam	60%
	Additional assignment	30%
	Peer evaluation	10%

Important Dates

Reading Week: Oct 14 – 20, 2024

Last class: Dec 3, 2024

NOTE: For additional important dates such as holidays, refer to the "Important Dates" section of the Registrar's Website at https://registrar.yorku.ca/enrol/dates

Resources

Reading 1 (recommended)	Martin Stevens: Sensory Ecology, Behaviour, & Evolution. Oxford University Press, 2013 180-day access to online version costs $63, Hardcopy more expensive. https://www.vitalsource.com/en-ca/products/sensory-ecology-behaviour-and-evolution-martin-stevens-v9780191651472
Reading 2 (recommended)	Kenneth Catania: Great Adaptations Princeton University Press, 2020 eBook for $22. Hardcopy is $32. https://www.vitalsource.com/en-ca/products/great-adaptations-kenneth-catania-v9780691209555
Reading 3 (recommended)	Martin Stevens: Secret Worlds. Oxford University Press 2021
eClass	https://eclass.yorku.ca I will use it as a repository for slides and lecture recordings. We will also use it to run the midterm and final exam.
Google Scholar	https://scholar.google.com/ https://scholar-google-ca.ezproxy.library.yorku.ca/ Use it to locate the papers we want to study (see Contents and Schedule), but also to search for more background as you prepare your assignments.

Learning Outcomes

Upon successful completion of this course, students should be able to:

- Describe the function of the specialized sensory mechanisms (such as visual acuity, eye movements and stereopsis) in humans and how they are used to control action, behavior and physiological state.
- Describe alternative solutions to similar problems in a variety of animals.
- List evolutionary and physical constraints that lead to these solutions.
- Evaluate technical solutions to sensory problems in robotics and automation.
- Explain how sensory processes are integrated into control structures to result in functional systems.
- Analyze published literature, including experimental data, about specialized sensory systems.
- Extract and communicate key concepts from original, empirical literature both orally and in writing.
- Defend scientific theories related to specialized sensory mechanism with logical reasoning.
- Compare theoretical terms and concepts related to specialized sensory mechanism to the reality of empirical science.

Copyright Protection of Course Material

All material associated with this course is the intellectual property of the instructor and/or protected under Canadian Copyright Law.

All material associated with this course, including lecture recordings, activities, quizzes and laboratories, are to be used for personal study purposes only. Unauthorized distribution in any form can lead to a violation under Canadian Copyright Law and/or Academic Misconduct charges under York University Senate Policy. Unauthorized distribution includes sharing and/or uploading of material anywhere and with anyone.

Penalties under Academic Misconduct can include failure in the course, a transcript notation and/or suspension.

Missed Assignment of Final Exam

Missed course assignments

Deadlines for Poster, Research Proposal, and Conference Talk assignments are strict. They are announced at the beginning of the course, and are set such that you always have a full week AFTER we finished the part of the course to which they refer. Accommodations requests do not apply to these deadlines. Accommodations, of course apply to assignments that you need to accomplish within a defined, restricted time window. In this course, that is only the case for the final exam.

Missed final exam

If you miss the final examination please complete and submit a Deferred Standing Agreement (DSA) form available from the Registrar's website to troje@yorku.ca (subject: BIOL3380) together with a letter outlining the reason for missing the exam, within one week of the missed exam.

See "Deferred Standing Guidelines" on the course eClass site for further details: https://myacademicrecord.students.yorku.ca/deferred-standing

If you are approved to write a deferred exam, an in-person final exam will be arranged on campus whenever approval to do so is granted. The format of the deferred final exam may be different from the main exam and might include to write an essay, short answer, multiple choice, or a mix of these options.

University Policies

Academic Honesty and Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at - http://www.yorku.ca/academicintegrity/

Important A note from the Faculty of Science Committee on Examinations and Academic Standards:

Numerous students in Faculty of Science courses have been charged with academic misconduct when materials they uploaded to third party repository sites (e.g. Course Hero, One Class, etc.) were taken and used by unknown students in later offerings of the course. The Faculty's Committee on Examinations and Academic Standards (CEAS) found in these cases that the burden of proof in a

charge of aiding and abetting had been met, since the uploading students had been found in all cases to be willfully blind to the reasonable likelihood of supporting plagiarism in this manner. Accordingly, to avoid this risk, students are urged not to upload their work to these sites. Whenever a student submits work obtained through Course Hero or One Class, the submitting student will be charged with plagiarism and the uploading student will be charged with aiding and abetting.

Note also that exams, tests, and other assignments are the copyrighted works of the professor assigning them, whether copyright is overtly claimed or not (i.e. whether the © is used or not). Scanning, sharing, uploading or publishing these documents constitutes copying, which is a breach of Canadian copyright law, and the breach is aggravated when scans are shared or uploaded to third party repository sites.

Access/Disability

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Student's in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Student Accessibility Services - https://accessibility.students.yorku.ca

York Accessibility Hub - http://accessibilityhub.info.yorku.ca/

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete and submit an accommodation request form

https://secure.students.yorku.ca/pdf/religious-accommodation-agreement-final-examinations.pdf

at least 3 weeks before the exam period begins.

Student Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - http://secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/