

SENSORY ECOLOGY

PCB 4932 ST (undergraduate section)

3 credits, Spring 2020

Course information

Class meeting times: **2:00 – 3:20 pm (Wed, Fri), Bio 105** (Biology Department, Main Campus)

Modality: P (face to face instruction)

Class components: Lecture required

This class is a split-level undergraduate (PCB 4932 ST) and graduate (BSC 5937 ST) class.

All demonstrations will be conducted during class times.

Brief course description

Sensory ecology is the study of how and why animals acquire, process and use information from their environment, and how sensory systems influence evolutionary processes.

Instructor contact information and office hours

Dr. Will Crampton

Office: BIO 402A (4th Floor, Biology Department)

Email: crampton@ucf.edu

Office Hours: **3:30-5:30 pm (Wed)**

Course prerequisites

Animal Behavior ZOO 4513 (B or better) or Evolutionary Biology PCB 4683 (B or better) (or as announced)

Course description

Sensory ecology is the study of how animals acquire, process, and make use of information from the environment (including from other animals), and how sensory systems influence evolutionary change. In this class you will learn about how animals acquire and process information from receptors and organs specialized for sensing light, sound, chemicals, electric fields, magnetic fields and more. You will learn why sensory information is useful to animals in a wide variety of terrestrial, freshwater, marine, and underground environments, and how sensory systems are adapted to different habitats and lifestyles. Finally, you will learn about how sensory systems influence key evolutionary processes.

Course objectives and format

Animals have evolved an astonishing array of sensory organs that are essential for survival and reproduction, and that are adapted to almost every ecological niche on the planet. This course has three aims: First, we review how, and for what purposes animals gather and use information, and how sensory systems and receptors work at the neurobiological, physiological, and anatomical level. Second, we examine how the form and function of sensory systems are matched to different habitats or ecosystems. Third, we will explore the role of sensory systems in key evolutionary processes such as reproductive isolation. For each of these themes we will not only discuss sensory systems that humans are familiar with (i.e. *visual*, *acoustic*, *olfactory*, and *tactile* senses), but also more exotic sensory systems such as *mechanoreception*, *electroreception* and *magnetoreception*, as well as acoustic and visual systems that detect stimuli outside our ranges of frequency sensitivity (ultrasound, infrasound, ultraviolet, infrared detection).

This is a lecture-based class, in which you will learn the theoretical basis of sensory ecology, as well as explore case studies and key experiments. There will be some reading assignments with in-class discussions of journal articles in .pdf. There will also be an interactive experiment with *live* electric fish

(weakly electric gymnotiforms from South America) in which groups of students will design, perform and analyze the results of short experiments over the course of 4 classes. A major goal of this class is to help you develop critical and independent scientific thinking.

Student learning outcomes

- Learn core concepts in sensory ecology
- Build on skills and knowledge learned from other relevant undergraduate classes
- Read and discuss key case studies and learn why and how these studies were conducted
- Learn to think critically about scientific questions and hypotheses
- Interpret graphs, figures, and basic statistics from the literature
- Understand basic experimental design and participate in a scientific experiment
- Write a review paper on a chosen topic

Course Materials and Resources

Martin Stevens (2013). *Sensory Ecology, Behavior, and Evolution*. Oxford University Press (paperback).

Class website: Webcourses (<https://webcourses.ucf.edu>).

Power point lectures, resources, .pdf papers, and announcements will be posted on Webcourses.

Assessment and grading procedures

Grading Scale:

A: $\geq 90 - 100$, **B:** $\geq 80 < 90$, **C:** $\geq 70 < 80$, **D:** $\geq 60 < 70$, **F:** < 60 .

"Curving": Curves may be applied to exams. Students who achieve over 100% in exams 1 or 2 due to curving will have those points "rolled over" to next exam.

Grading breakdown:

Exam 1: 20% (based on lectures and in-class Discussions)

Exam 2: 20% (based on lectures and in-class Discussions)

Written term paper: 25%

Notes on demonstrations (in-class experiments): 10%

In-class contribution to discussions: 5% (based on quality **not quantity** of comments/questions)

Final exam 20%: (semi-cumulative)

Exams 1 and 2: Multiple choice responses. I will provide scantrons.

Written term paper: You will pick a Sensory Ecology-related subject of interest to you and conduct a literature-based review. The final document should be 6-10 pages long. Submit a title (maximum 20 words) and abstract (maximum 250 words) for pre-approval by Week 9 (see deadlines in Schedule). Details of the required format for the submitted version of the term paper will be posted on Webcourses.

Written demonstration notes: You will be graded on your notes, which should be compiled on sheets of letter paper and stapled together for submission. Please use the worksheets that will be handed out/posted on Webcourses. Please hand in your demonstration notes at the end of semester.

Final exam: Multiple choice and short answers/multiple choice. I will provide scantrons.

Pdf paper discussions: Journal articles covering important topics/case studies will be periodically posted. You will have 1 week to read these before they are discussed in the class. An announcement will be made on Webcourses when a pdf paper is posted.

Extra credit: up to 2% points per semester will be given per student for consistent outstanding contributions to in-class discussions.

Course policies and other information

Graduate student participation: This is a split-level undergraduate and graduate class. Please be aware that class activities will be modified slightly depending on the ratio of undergraduate to graduate students in the class. Also, please be aware that graduate students will be graded differently to the undergraduates. During the demonstration in Weeks 12-14, graduate students will lead groups of undergraduates in the design and execution of the in-class experiments, and in the analysis and presentation of the results. They will also present their term papers as oral presentations for class discussion. If there is no graduate student enrolment the in-class demonstrations will proceed without their involvement. Likewise, the graduate student presentations planned for Week 12 will be replaced with another activity.

Make-up policy: Make-up exams for Exams 1 and 2 can be provided only for valid, documented reasons (e.g. illness, mandatory religious observance, or authorized university events). Please contact me in advance as soon as possible if you require a make-up. There will be no make-ups for missed in-class activities. However, one in-class activity per semester will be automatically dropped. Please contact me in the case of attendance difficulties.

Communication: All e-mail correspondence should be via UCF email addresses or through Webcourses. By FERPA regulation emails from third-party email addresses cannot be responded to. Please place the course number and a brief subject description in the email title line. Please make sure you put your name at the end of the email.

General class policies: All members of the class must abide by the UCF Golden Rules of academic conduct and honesty.

Office hours: I encourage everybody to use office hours as a resource to discuss any part of the course, and your academic progress. If you are unable to come to the scheduled office hours, please contact me to seek an out-of-hours appointment.

Final Note: I reserve the right to change the syllabus and class schedule. These changes will be announced in lecture and on Webcourses.

Academic integrity

Students must familiarize themselves with [UCF's Rules of Conduct](#), which states that students are prohibited from engaging in academic misconduct, such as

- Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course related material also constitutes cheating.

- Communication to another through written, visual, electronic, or oral means. The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment or project.
- Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third party vendor without authorization or without the express written permission of the University and the Instructor. Course materials include but not limited to class notes, Instructor's power points, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.
- Falsifying or misrepresenting the student's own academic work.
- Plagiarism: Whereby another's work is used or appropriated without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
- Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
- Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.

Responses to Academic Dishonesty, Plagiarism, or Cheating

UCF faculty members have a responsibility for your education and the value of a UCF degree, and so seek to prevent unethical behavior and when necessary respond to infringements of academic integrity. Penalties can include a failing grade in an assignment or in the course, suspension or expulsion from the university, and/or a "Z Designation" on a student's official transcript indicating academic dishonesty, where the final grade for this course will be preceded by the letter Z. For more information about the Z Designation, see <http://goldenrule.sdes.ucf.edu/zgrade>.

For more information about UCF's Rules of Conduct, see <http://www.osc.sdes.ucf.edu/>.

Course accessibility statement

It is my goal that this class be an accessible and welcoming experience for all students, including those with disabilities that may impact learning in this class. If anyone believes the design of this course poses barriers to effectively participating and/or demonstrating learning in this course, please meet with me to discuss reasonable options or adjustments. You may also contact SAS (Ferrell Commons 185; 407-823-2371; sas@ucf.edu) to talk about academic accommodations.

Campus safety statement

Emergencies on campus are rare, but if one should arise in our class, we will all need to work together. Everyone should be aware of the surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Please make a note of the guide's physical location and consider reviewing the online version at http://emergency.ucf.edu/emergency_guide.html.
- Familiarize yourself with evacuation routes from each of your classrooms and have a plan for finding safety in case of an emergency.
- If there is a medical emergency during class, we may need to access a first aid kit or AED (Automated External Defibrillator). To learn where those items are located in this building, see <http://www.ehs.ucf.edu/AEDlocations-UCF> (click on link from menu on left).
- To stay informed about emergency situations, sign up to receive UCF text alerts by going to my.ucf.edu and logging in. Click on "Student Self Service" located on the left side of the screen

in the tool bar, scroll down to the blue “Personal Information” heading on your Student Center screen, click on “UCF Alert”, fill out the information, including your e-mail address, cell phone number, and cell phone provider, click “Apply” to save the changes, and then click “OK.”

- If you have a special need related to emergency situations, please speak with me during office hours.
- Consider viewing this video (<https://youtu.be/NIKYajEx4pk>) about how to manage an active shooter situation on campus or elsewhere.

Statement of accommodations for active-duty military students

If you are a deployed active duty military student and feel that you may need a special accommodation due to that unique status, please contact me to discuss your circumstances.

Sensory Ecology – PCB 4932 ST – Spring 2020

Preliminary Schedule:

Week	Date	Lecture	Section	Subject	Chapter	Deadlines:
Week 1	8-Jan	-	-	Course Introduction/Syllabus		
	10-Jan	1	Introduction	What is Sensory Ecology		1
Week 2	15-Jan	2	Sensory Processing	Overview of Sensory systems		2
	17-Jan	3	Sensory Processing	Overview of Sensory systems		2
Week 3	22-Jan	4	Sensory Processing	The senses: I - Light, Sound,		2
	24-Jan	5	Sensory Processing	The senses: II - Chemical, Mechanical		3
Week 4	29-Jan	6	Sensory Processing	The Senses: III - Electrical, Magnetic		3
	31-Jan	7	Sensory Processing	Encoding Information: I - Vision, olfaction		3
Week 5	5-Feb	-	-	catch up		
	7-Feb	-	-	EXAM 1		
Week 6	12-Feb	8	Sensory Processing	Trade offs, Energy costs, predators, and Sensory integration		4
	14-Feb	9	Communication	Communication Signals 1	5 & 6	
Week 7	19-Feb	10	Communication	Communication Signals - 2		7
	21-Feb	11	Communication	Deception, Mimicry, and Sensory Exploitation		8
Week 8	26-Feb	12	Diversification and Adaptation	Signal transmission and the environment I		10
	28-Feb	13	Diversification and Adaptation	Signal transmission and the environment II		10
Week 9	4-Mar	14	Diversification and Adaptation	Sensory tuning and noise		10
	6-Mar			catch up		title/abstract for term paper
SPRING BREAK						
SPRING BREAK						
Week 10	18-Mar			EXAM 2		
	20-Mar	15	Diversification and Adaptation	Divergence, the Environment, and Speciation		11
Week 11	25-Mar	16	Diversification and Adaptation	Divergence and Speciation		11
	27-Mar	17	Diversification and Adaptation	Arms races, coevolution, Life's diversity		9, 12
Week 12	1-Apr	18	Case studies	Electric fish		pdf paper (TBA)
	3-Apr		Demonstration/Experiment	Electric fish Experiment I - Introduction		pdf paper (TBA)
Week 13	8-Apr	-	Demonstration/Experiment	Electric fish Experiment II - Temperature and Conductivity		
	10-Apr	-	Demonstration/Experiment	Electric fish Experiment III - Pulse Rate modulations		
Week 14	15-Apr	-	Demonstration/Experiment	Electric fish Experiment IV - Analysis and discussion		
	17-Apr	-	Demonstration/Experiment	Catch up/conclusion		
Week 15	date to be determined			EXAM 3 (FINAL)		Term paper, Demonstration notes

TBA = to be announced.