

1. Course Title: GMS 6070-2B96 – Sensory Biology

Classroom: Tuesday, Wednesday, Thursday 9:00-10:00 am – ARB Room R5-231 (Department of Pharmacology & Therapeutics Maren Conference Room)

Course Director:

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This course is aligned with the Department of Pharmacology and Therapeutics.

2. Office hours: by appointment

3. Course Objectives

This course is for basic and clinical scientists that wish to gain insights into how animals detect, process and respond to sensory stimuli such as light, odors, sound and temperature. Students will learn about the molecular mechanisms and neural systems used by vertebrates and invertebrates to sense the external and internal world. The comparative approach emphasizes common principles of sensory coding as well as the unique strategies employed to address specific biological needs. In addition, lectures and associated reading will highlight the use of molecular biological, pharmacological, physiological, neurobiological and behavioral analyses to dissect the function and dysfunction of these sensory systems.

The course meets in the Spring semester for three 1-hr sessions per week, and includes faculty with expertise in sensory biology. It will use multimodal instructional approaches combining didactic lectures, reading assignments and mentored student presentations.

Students enrolling in the course should be familiar with basic principles of molecular biology, biochemistry, physiology, pharmacology and cell biology. Lectures will be provided by faculty from the College of Medicine and other UF colleges who are experts in sensory biology. An accompanying textbook (*Biology of Sensory Systems*, 2nd ed., Wiley) as well as the primary scientific literature will serve as important complementary learning resources.

General Course Learning Objectives

- (a) Describe the physical properties of diverse sensory stimuli (e.g., chemicals, pressure, temperature, light, gravity).
- (b) Describe the molecular, cellular and physiological mechanisms by which animals detect sensory stimuli (e.g., membrane receptors and ion channels; types of sensory cells and specialized sensory structures; intracellular transduction mechanisms).
- (c) Describe the neural pathways that communicate sensory information from the external or internal environment to specialized regions of the central nervous system, with an emphasis on how the structure of these pathways allows for the communication of specific stimulus features (e.g., position in sensory space).
- (d) Describe the neural and physiological strategies used to encode and extract specific features of a sensory stimulus (e.g., identity, quantity, intensity, timing).
- (e) Compare and contrast the strategies employed by different species to detect and encode similar sensory stimuli (e.g., odor detection by mammals and insects; mechanotransduction in the vertebrate ear vs. the fish lateral line).

4. Course Schedule

Sensory Biology Spring 2017 Schedule			
	Tuesday (1 hr)	Wednesday (1 hr)	Thursday (1 hr)
Introduction and General Principles of Sensation	January 3 <i>NO CLASS</i>	January 4 <i>Sensory stimuli, coding principles</i> S. Munger	January 5 <i>Sensory transduction mechanisms</i> S. Munger
Chemical Senses I	January 10 <i>Neural circuits and sensory processing</i> B. Ache	January 11 <i>Vertebrate gustatory systems</i> S. Munger	January 12 <i>Central processing of taste information</i> S. Munger
Chemical Senses II	January 17 <i>Mammalian main olfactory system</i> J. McIntyre	January 18 <i>Chemical sensing in nematodes</i> R. Butcher	January 19 <i>Mammalian accessory olfactory system</i> J. McIntyre
Chemical Senses III	January 24 <i>Chemical sensing in arthropods</i> B. Ache	January 25 <i>Central processing of olfactory information</i> B. Ache	January 26 <i>O₂ and CO₂ sensing</i> S. Munger
Temperature, chemical and mechanosensation	January 31 <i>Trigeminal chemesthesis; chemical itch</i> R. Xiao	February 1 <i>Temperature sensation</i> R. Xiao	February 2 <i>Mechanosensation in invertebrates</i> R. Xiao
Somatosensation	February 7 Peripheral mechanisms of touch R. Johnson	February 8 Peripheral mechanisms of proprioception R. Johnson	February 9 Central processing of touch and proprioception, sensorimotor feedback K. Oweiss
Nociception	February 14 The detection of painful stimuli Rob Caudle	February 15 Central processing of pain information Rob Caudle	February 16 Pain perception and treatment Rob Caudle
Perception	February 21 Midterm exam due	February 22 Human Sensory Perception L. Bartoshuk	February 23 Human Sensory Perception L. Bartoshuk
Equilibrium and Hearing I	February 28 Hair cells and the lateral line J. Liao	March 1 The vestibular organs S. Someya	March 2 The vertebrate external, middle, inner ear S. Someya
Equilibrium and Hearing II	March 14 Central processing of auditory information: pathways, frequency coding A. Lotto	March 15 Central processing of vestibular information; vestibular reflexes S. Griffiths	March 16 Hearing and language S. Nittrouer

Equilibrium and Hearing III; Vision I	March 21 Disease and disorders of the vestibular and auditory systems H. Siburt	March 22 Light and optics TBD	March 23 Opsins, other light-sensitive receptors W. C. Smith
Vision II	March 28 Invertebrate eyes W. C. Smith	March 29 The vertebrate eye and retina W. C. Smith	March 30 Visual fields and binocular vision J. Coleman
Vision III	April 4 Central visual pathways J. Coleman	April 5 Processing visual information J. Coleman	April 6 Disease and disorders of the visual system S. Boye
Assessment	April 11 Student Presentations Final exam due	April 12 Student Presentations	April 13 Student Presentations

5. Methods of Evaluation and Grading

Students will be evaluated based on their performance on two exams (midterm, final), an oral presentation to the class, and a short accompanying paper.

Exams (70% of grade): Two exams (midterm, 35% of course grade; final, 35% of course grade) will be composed of several essay questions prepared and graded by course faculty. Each exam will cover material presented in that section of the course, but material covered on the final exam will assume basic mastery of major concepts presented in the first section of the course. Exams will be “take-home” and “open-book.” Exam questions will be distributed on Thursday, October 13 and due Tuesday, October 18 (midterm) or distributed on Thursday, December 8 and due, Tuesday, December 13 (final).

Presentations and short paper (30% of grade; faculty evaluation): Each student will use material presented in class plus a review of the relevant literature to discuss, in a short paper (~ 5 pages; 15% of grade) and a short oral presentation (15-20 min; 15% of grade), an area of sensory biology not covered directly in the didactic portion of the course. Students will work with a faculty mentor to select the subject of the paper and presentation.

The following grading scale will be used for this course:

A	93-100%	C	74-76%
A-	90-92%	C-	70-73%
B+	87-89%	D+	67-69%
B	84-86%	D	64-66%
B-	80-83%	D-	60-63%
C+	77-79%	F	< 60%

At the end of the semester the final letter grade cut-offs may be adjusted lower, but will not be adjusted higher.

6. Attendance: Requirements for class attendance and make-up exams, assignments and other work in this course are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

7. Accommodations for students with disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

8. Required and recommended textbooks: The textbook *Biology of Sensory Systems*, 2nd edition (ed., C. Smith; Wiley) is required, and will be supplemented by other materials supplied as pdf files. It is available the the Health Sciences Library.

9. Information on current UF grading policies: please consult the following website:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

10. Evaluation process: Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at:
<https://evaluations.ufl.edu>

11. Materials, Supplies, Fees: not applicable