

# Sensation and Perception

## Spring 2019

(PSY 345 / NEU 325)

**Time:** Tues / Thurs 10-10:50am.

**Location:** Guyot 10

**Instructor:** Dr. Jonathan Pillow ([pillow@princeton.edu](mailto:pillow@princeton.edu))

Office: PNI 254 Office Hours: Tues. 11-12pm and by appt.

**Als:** **Aaron Kurosu** ([akurosu@princeton.edu](mailto:akurosu@princeton.edu))

**Shruthi Ravindranath** ([shruthi@princeton.edu](mailto:shruthi@princeton.edu))

Office Hours: by appt., and TBA during pre-exam and post-exam weeks

course website: <http://pillowlab.princeton.edu/teaching/sp2019/>

### **Course Description**

This course will provide an introduction to the scientific study of sensation and perception. We tend to think of the ability to perceive the world around us as an automatic process that happens ‘for free’ whenever we use our eyes, ears, nose, and other sense organs. But sensation-and-perception is an *active* process that relies on exquisitely sensitive receptors and powerful computational machinery housed in the brain, spinal cord, and peripheral nervous system. Our perceptual capabilities have been honed by evolution over many millions of years to arrive in their current form. The central focus of this course will be to examine how these sensory systems work and why. We will undertake a detailed study of the major senses (vision, audition, touch, smell, taste), using insights and methods from a variety of disciplines (philosophy, physics, computer science, neuroscience, psychology). We will begin with a study of the physical basis for perceptual information (e.g., light, sound waves), and proceed to the biological and psychological processes by which such information is converted to percepts in the brain.

### **Learning Objectives**

The objective of this course is to provide a thorough introduction to the biological and psychological study of the senses, and the computational and neural mechanisms that underlie sensation and perception.

### **Textbook**

*Sensation & Perception, 5th ed.* Wolfe, Kluender, et al. Sinauer 2018.

The textbook has a companion website with overviews, study aides, essays on select topics, as well as some nice demonstrations of perceptual illusions we’ll discuss in class:

<https://oup-arc.com/access/sensation-and-perception-5e-student-resources>

### **Readings**

Additional readings from the primary scientific literature will be assigned weekly, to be discussed during precepts. List available at: <http://pillowlab.princeton.edu/teaching/sp2019/readings.html>

## **Piazza**

We encourage all students to post questions to Piazza instead of sending email. This will allow others to benefit from your question, and will often result in a faster and more complete answer (since your fellow students may post answers before instructors can). Please participate on Piazza, and endorse questions and answers as you see fit. Piazza activity will count toward the 5% participation grade. (More details to be provided during precept).

Course Piazza page: <https://piazza.com/princeton/spring2019/psy345neu325/home>

Piazza course sign-up link: <http://piazza.com/princeton/spring2019/psy345neu325>

## **Course requirements and grading**

Two mid-term exams (25% each), and cumulative final exam (35%), plus active participation in precepts. Students will be expected to lead a discussion of at least one scientific paper during precept and participate in discussions of jointly-presented papers (i.e. when there is no assigned presenter). Participation grade (total 15%) will be determined by the AI in consultation with the instructor, of which 10% will depend on the precept paper presentation and review, and 5% on participation in discussions led by other students. Attendance at precepts is mandatory. Two absences will be allowed per student; for every additional absence beyond the second, 2% will be deducted from the student's participation grade.

Note also (very important!): all students must complete a *Research Participation Assignment* to receive credit for this course (see final page of syllabus).

## **Philosophy**

Learning (like perception itself) is an active process. The more actively students engage with course materials and ideas, the more they will learn. The goal of this course is not so much to convey a set of facts as to introduce a discipline and its methods of inquiry. Our primary aims will be to dissect the ideas presented in the textbook and readings, to challenge accepted theories of perceptual phenomena, and generate new ideas and experimental hypotheses about how our percepts of the world are constructed.

## **Tentative schedule of topics and readings:**

<u>Week</u>	<u>Lecture Topic</u>	<u>Textbook Reading</u>
<b>(1)</b>	Intro: Philosophy & Basic Methods	Chap. 1
	Weber's law & Psychophysics	Chap 1
<b>(2)</b>	Light, Optics, & Early Vision	Chap. 2
	Retina & Receptive Fields	Chap. 2
<b>(3)</b>	Visual Cortex & Spatial Vision I	Chap. 3

	Visual Cortex & Spatial Vision II	Chap. 3
(4)	Object Recognition	Chap. 4
	Object Recognition	Chap. 4
(5)	<b>Exam I (Tues, Mar 5)</b>	Chap. 5
	Color I	Chap. 5
(6)	Color II	Chap. 5
	Space & Depth Perception	Chap. 6
(7)	<i>Spring Break</i>	
(8)	Motion Perception I	Chap. 8
	Motion Perception II.	Chap. 8
(9)	Sound & Audition I	Chap. 9
	Sound & Audition II	Chap. 9
(10)	Bayesian Theory of perception	
	<b>Exam #2 (Thurs, Apr 11)</b>	
(10)	Hearing in the Environment	Chap. 10
	Auditory Perception	Chap. 10
(11)	Somatosensation I	Chap. 13
	Somatosensation II	Chap. 13
(12)	Olfaction I	Chap. 14
	Olfaction II	Chap. 14
(13)	Gustation I (taste)	Chap. 15
	Gustation II (taste)	Chap. 15

**Cumulative Final Exam** (date and time tba)

## **Research Participation Assignment**

Students in this course must complete a research participation assignment. There are two options: students may participate in psychology experiments for course credit, or may opt to complete the alternative research writing assignment.

Four hours of experimental participation are assigned to any student in this course who has not already completed 8 hours of participation for other psychology courses in the past.

Students will have access to sign up for experiments beginning on February 14, 2019, and must complete the required number of sessions by the last day of Reading Period in order to pass the course. To be clear: experimental participation must be completed satisfactorily by May 14, 2019.

Please refer to the Research Participation Assignment document posted on Blackboard for complete details and instructions.

This assignment reflects the psychology department's belief that experiencing research as a participant adds greatly to a student's understanding of course material, particularly to the student's understanding of how psychologists study behavior. Your participation not only furthers your education about the nature of psychological research; it also makes a substantial, critical contribution to psychological research at Princeton and to science in general.

As an alternative to research participation, students may complete the research writing assignment. Each paper is worth .5hrs of credit. Eight papers would be required if you choose not to participate in any experiments. Please see the Research Assignment document posted on Blackboard for further details.

All questions pertaining to this assignment should be directed to RoseMarie Stevenson ([rosemari@princeton.edu](mailto:rosemari@princeton.edu)).

Link to credit pool: <https://princeton.sona-systems.com/>