

# Systems Neuroscience, 2017: Syllabus

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Course Materials: Research Papers (see Section XI: Curriculum)  
(*NO TEXTBOOK*)

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**CLASS TIME (PETERSON 101)** ..... 1000-1120 Mon/Wed  
**OFFICE HOURS**..... 228B Huestis Hall  
-.... Mon /Wed: 1300-1400

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NOTE: The electronic version of this document will be available on Canvas as a PDF file, in which the hyperlinks (underlined links) are functional.

## II. Notice to Students with Disabilities

The University of Oregon is working to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please let me know as soon as possible, in person or via email. You may also wish to contact [Accessible Education Services](#) at (541) 346-1155 or [uoaec@uoregon.edu](mailto:uoaec@uoregon.edu).

### III. Grade Components

**Table 1**

ITEMS	#	461	561	WHEN
Quizzes	Best 8 of 10	16	16	<b>Weekly (day TBD)*</b>
Midterm	1	25	25	<b>Wed 5/3</b>
Final	1	30	30	<b>Mon 6/12 (1015 h)</b>
Reading Responses		10	10	<b>When papers are scheduled</b>
Attendance & Participation		5	5	
Term Paper	1	14	-	<b>6/4</b>
Self-study	1	--	14	<b>6/4</b>
Total		100	100	
Extra credit	(Max)	4	4	

\* To Be finalized in first lecture with input from class

#### **Assignment / Exam dates not in Table 1**

Day, Date	Time	Assignment due
Thu, Apr 20	2359	Term paper area / title
Fri, Apr 28	2359	Term paper topic & justification, and a copy of the research paper selected.
Wed, May 03	1000	MID-TERM
Sun, Jun 04	2359	BI-461 Term Paper
Sun, Jun 04	2359	BI-561 Project report
Mon, Jun 12	10:15	<a href="#">Final Exam</a>

### IV. Exams (55%)

#### **MIDTERM - 25%; FINAL 30%**

- Two exams
  - Midterm (25%)
  - Final (30%)
- Midterm will be administered during lecture time (1 hr 20 min)
- Final will be 2 hrs long
- Materials required for exams: #2 pencil for scantrons; scientific calculator

Exams will test conceptual understanding, not just information. The exams will be part multiple choice, part fill-in-the-blank/match the information and part free response. The Final will emphasize materials covered in class since the midterm, and only conceptual questions about pre-midterm material. ***No make-up exams will be administered without a valid, documented reason for the absence!*** If unforeseen circumstances prevent you from taking an exam, notify the instructor immediately. Allowable excused absences are court orders, documented medical emergencies and athletic events such as away games for student athletes. All such occasions must be accompanied by official documentation. Make-up exams may be essay-type.

## V. Quizzes (16%)

- Administered on Canvas
- Quick, non-cumulative reviews of materials since the preceding quiz
- Short answer questions
- 10 quizzes on designated days, top 8 scores will count towards grade

The quizzes serve as quick reviews of recently covered materials as well as to help you keep up with the reading assignments. Quizzes will contain 3-6 questions that pertain to the most recently presented lecture material. Questions will sometimes be from readings that have been assigned but may not yet have been discussed in the lectures; however, these questions will be of a more general nature and should be easily answerable. No make-up quizzes will be offered. **NOTE:** *Some of the quiz questions will require calculation.*

## VI. Reading Reports (10%)

- One summary report per research paper in curriculum
- Should summarize main points of assigned paper
- Report will be peer reviewed and returned at end of class on the same day
- No late submissions allowed
- Reports should be printed, or hand-written in clearly legible handwriting. Hard-to-read reports will be penalized.

Summarize the main findings and any other points you think are important. No more than 400 words. Handwritten submissions are OK. Peer review feedback that you are not working sufficiently hard on your submissions should be taken seriously – such feedback after the first two papers will result in a partial grade. Reviews should be analytical, but positive in tone: no negative, derogatory or insulting comments, please.

## VII. Class attendance & participation (5%)

**Attendance** will be noted during each class. Students are expected to attend every class, and there is no make-up for missed classes (exceptions: academic or documented health issues). **Class participation** will be tracked quantitatively for participation, and qualitatively for correctness of responses and comprehensiveness and knowledge of the topic. For all lectures except the first, each student is expected to have read the paper for the day beforehand, and to be familiar with the methods and results sections. You may be called upon to explain figures or tables in a random order, to ensure that all students are called on at the same rate over the course of the term.

## VIII. Project report (BI-561 only; 14%)

Students enrolled in BI-561 are expected to design research project which can take one of a few forms, based on either their current research, or their future interests. Students enrolled in BI561 will meet the instructor later in the 1<sup>st</sup> week of class to discuss options.

## IX. Term paper (BI-461 only; 14%)

This will largely be an individual assignment, with a group presentation at the end of term. Papers will be grouped by instructor according to the areas of research, and each group will present a summary towards end of term.

1. **TOPIC:** Find an appropriate topic (deadline: *Apr 20<sup>th</sup>, 23:59:59 – 1 point*)
  - Pick an original research article from the last two years, that discusses research related to Systems Neuroscience that is of interest to you. Topics must be approved by instructor.
  - Submit a brief (1 paragraph, max 400 words) write-up defending the choice of topic. It must be based on research in System Neuroscience, be of sufficient general interest, and based on an empirical research article (not a review, abstract, poster, or talk) - (deadline: *Apr 28<sup>th</sup>, 23:59:59 – 1 point*)
  
2. **TERM-PAPER:** Write a well-researched, comprehensive report on the primary research article. It must be obvious to the reader that you have a good grasp of the findings of the paper and were able to analyze the research and in a thoughtful manner [deadline hard-copy (*5 pm, Fri Jun 2<sup>nd</sup>*) or an electronic copy (*2359h, Sun, Jun 4<sup>th</sup>*)]
  - Describe the original research article, critically examining the methods, findings and interpretation
  - One of the fundamental hallmarks of scientific writing: to give extraordinary weight to any argument that may disprove any findings or interpretations. Such points are usually found in the 'Discussion' section, are rarely found in summaries or abstracts, and are usually glossed over in any news coverage. Learn to recognize these arguments, and summarize them.
  - The final report should be 6-8 pages (11-12 pt font; 1.5 or double spaced; 1.5 inch left margin, other 1 inch margins). You can submit a hard-copy (*5 pm, Fri Jun 2<sup>nd</sup>*) or an electronic copy (*2359h, Sun, Jun 4<sup>th</sup>*).[10 points]
  
3. **PRESENTATION:** Last 20 min of lectures towards end of term will comprise a group presentation of your paper findings, one slide per student. Slides will be submitted as a Microsoft PowerPoint presentation, in collaboration with others in your group (deadline: *May 30<sup>th</sup>, 23:59:59*) [2 points]. Group presentations should be consistent (same format, font etc), and groups are welcome to create an overall introduction or summary of all individual findings of the group.

Term paper and presentation templates will be available on Canvas.

Presentations will consist of one slide per student, and each slide should take about 1 minute to present the main findings and points of interest that the student discovered during their research and writing process. Presentation points are contingent on timely term-paper submission.

## X. Submitting Assignments

- Electronic submission:
  - Canvas where appropriate
  - If Canvas is offline near the deadline
  - Email to avinash@uoregon.edu
- Hard copies:
  - Mail slot labeled 'SINGH' in Biology office (77, Klamath Hall) before 5 pm
  - Mail Slot labeled 'SINGH' in Hallway opposite 222 Huestis Hall before 5 pm
  - Turn it in to instructor before or after class

## XI. Curriculum: List of research papers

### I. Comparing the two ears: Computation of binaural time disparities and spatial hearing.

#### A. Coding of monaural phase

- Sullivan WE, Konishi M. 1984. Segregation of stimulus phase and intensity coding in the cochlear nucleus of the barn owl. *J. Neurosci.* **4**:1787-1799.

#### B. Computation of binaural phase difference

- Carr CE, Konishi M. 1990. A circuit for detection of interaural time differences in the brain stem of the barn owl. *J. Neurosci.* **10**:3227-3246.

#### C. Computation of time difference from phase difference (assigned portions only)

- Wagner H, Takahashi TT, Konishi M. 1987. Representation of interaural time differences in the central nucleus of the barn owl's inferior colliculus. *J. Neurosci.* **10**:3106-3116.

#### D. An alternative to the Jeffress Model (assigned parts of papers only)?

- (1) McAlpine D, Jiang D, Palmer AR. 2001. A neural code for low-frequency sound localization in mammals. *Nat Neurosci* **4**:396-401.
- (2) Brand A, Behrend O, Marquardt T, McAlpine D, Grothe B. 2002. Precise inhibition is essential for microsecond interaural time difference coding. *Nature* **417**:543-547

### II. Comparing two points in time: Computation of target range in echolocating bats

#### A. Phase Sensitivity

- Simmons JA. 1979. Perception of echo phase information in bat sonar. *Science* **204**:1336

#### B. Phase sensitivity & Hyperacuity

- Simmons JA, Ferragamo M, Moss CF, Stevenson SB, Altes RA, 1990. Discrimination of jittered sonar echoes by the echolocating bat, *Eptesicus fuscus*: The shape of target images in echolocation. *J Comp Physiol* **167**:589-616.

### III. Comparing the two eyes: computation of retinal disparities and stereoscopic vision

- #### A.
- Barlow HB, Blakemore C, Pettigrew JD. 1967. The neural mechanisms of binocular depth discrimination. *J. Physiol.* **193**: 327-342.

- B. Trotter Y, Celebrini S, Stricanne B, Thorpe S, Imbert M. 1992. Modulation of neural stereoscopic processing in primate area V1 by viewing distance. *Science* **257**:1279-1281.
- C. Cumming BG, Parker AJ. 2000. Local disparity not perceived depth is signaled by binocular neurons in cortical area V1 of the macaque. *J. Neurosci.* **20**:4758–4767

#### **IV. Comparing body surfaces: Jamming avoidance response in weakly electric fishes**

- A. Carr CE, Heiligenberg WF, Rose GJ. 1986. A time-comparison circuit in the electric fish midbrain. I. Behavior and physiology. *J. Neurosci.* **6**:107-119.
- B. Heiligenberg WF, Rose GJ. 1986. Gating of sensory information: Joint computations of phase and amplitude data in the midbrain of the electric fish, *Eigenmannia*. *J. Comp. Physiol.* **159**:311-324.

#### **V. Comparing neuronal responses and behavioral performance**

- A. Somatosensory Thresholds:  
Johansson RS, Vallbo AB. 1979. Detection of tactile stimuli. Thresholds of afferent units related to psychophysical thresholds in the human hand. *J Physiol* **279**:405-422  
Visual Motion
- B. Britten KH, Shadlen MN, Newsome WT, Movshon JA 1992 The analysis of visual motion: A comparison of neuronal and psychophysical performance. *J. Neurosci.* **12**: 4745-4765.
- C. BrittenKH, Shadlen MN,Celebrini S, NewsomeWT,Movshon JA. 1996. A relationship between behavioural choice and the visual responses of neurons in macaque MT. *Vis. Neurosci.* **13**:87–100
- D. IF TIME PERMITS: Cook EP, Maunsell, JH. 2002. Dynamics of neuronal responses in macaque MT and VIP during motion detection. *Nat Neurosci* **5** (10), 985-994