E SC 497B: Neural Circuits and Dynamics
Tues/Thurs 4:40-5:55, location 012 Life Sciences Building
Professor: Patrick Drew
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In this class, students will read classic and recent papers to obtain an understanding of how neural circuits, and their dynamics, underlie sensation, learning, and behavior. Students will learn how to dissect the primary literature while covering current topics in neural circuits and dynamics.

Course topics include:
- Receptive fields and their construction
- Network dynamics and spontaneous activity
- Plasticity and synaptic dynamics
- Oscillations, gain control and neural correlations
- Neural circuits mediating behavior

Evaluation: 20% class participation, 50% paper reviews, 30% final paper. In each class period, we will discuss two recent or classic papers from the primary literature. To facilitate an informed discussion, a short writeup on the assigned papers will be due at the beginning of class. A final paper, reviewing an area of current research, will be due 5pm, April 30th.

Papers can be downloaded from:
http://www.esm.psu.edu/~patrick/Drew_Lab/Neural_Circuits.html
Paper reviews
To ensure that the discussion is well informed, the students should write a 1-2 paragraph review of each of the day’s papers.
The review should address:
1) What is the hypothesis being tested?
2) Why is this question/observation important?
3) How do the experiments, support or refute the hypothesis? Be sure to discuss the limitation of the experimental techniques, limitation of controls, and ambiguities in interpretation.
Paper reviews are due at the beginning of class. No late papers review will be accepted without a medical excuse. *Students may discuss the papers with each other, but paper reviews should be written without collaboration.*

Extra Credit
Students may receive extra credit for writing up a ‘paper review’ for a Neuroscience related seminar on campus. This seminar must not be attended as a requirement for another class. Each seminar writeup is worth 1%, and up to 5 may be written up.

Classroom discussion
Each class will be a discussion of the assigned papers. Students are responsible for reading and comprehending the assigned papers and to constructively contribute to the classroom discussion.

Final paper
The final paper should be a ~8-10 page summary of the current literature in a student chose area of research. The final paper is due April 30th. Students should submit a paragraph on their topic of interest by March 6th. Graduate students should not write a paper covering their area of research.

Tentative reading list:
Papers can be downloaded at [http://www.esm.psu.edu/~patrick/Drew_Lab/Neural_Circuits.html](http://www.esm.psu.edu/~patrick/Drew_Lab/Neural_Circuits.html)

1/8/13-First class

1/10/13-Receptive fields (1)
Wurtz, R. Visual receptive fields of striate cortex neurons in awake monkeys. *J Neurophysiol*
1/15/13-Receptive fields (2)

1/17/13-Receptive fields (3)

1/22/13-Connectivity (1)

1/24/13-Connectivity(2)

1/29/13-Synaptic dynamics (1)

1/31/13-Network dynamics (1)

2/5/13-Network dynamics (2)


2/7/13-Gain control (1)


2/12/13-Gain control (2)


2/14/13-Gamma Oscillations (1)


2/19/13-Philosophy


2/21/13-Gamma Oscillations (2)


2/26/13-Songbird-Song production

**2/28/12-Songbird-Song learning**


**3/12/13-Plasticity (1)**


**3/14/13-Plasticity (2)**


**3/19/13-Variability**


**3/21/13-Touch**


**3/26/13-Perception and neural activity**


3/28/13-Neurovascular coupling (1)

4/2/13-Neurovascular coupling (2)

4/4/13-Global brain responses

4/9/13-Resting state activity

4/11/13-Spontaneous activity

4/16/13-Ongoing activity


4/18/13-olfaction


4/23/13 - TBD

4/25/13 - TBD
Note to students with disabilities: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services, ODS located in room 116 Boucke Building at 814-863-1807 (V/TTY). For further information regarding ODS, please visit their web site at www.equity.psu.edu/ods/ Instructors should be notified as early in the semester as possible regarding the need for reasonable academic adjustments.

DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS
ACADEMIC INTEGRITY

The Department of Engineering Science and Mechanics at the Pennsylvania State University considers academic training to be apprenticeship for practice in the professions. Students are expected to demonstrate a code of moral integrity and ethical standards commensurate with the high expectations that society places upon professional practice. Accordingly, it is the policy of the department to maintain the highest standard of academic honesty and integrity. The Council of Academic Deans statement describing academic integrity can be found at http://www.engr.psu.edu/Forms/AcademicIntegrity/form.pdf

Academic dishonesty includes, but is not limited to, cheating, copying on tests, plagiarizing, acts of aiding or abetting, unauthorized possession of materials, tampering with work, ghosting, altering examinations and theft of any property (hardware, software, lab equipment and supplies, intellectual property, etc.). Students are encouraged to report incidents of academic dishonesty to their instructors in order to promote a fair academic climate and equal opportunity learning environment.

A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. A student contesting such a charge may seek redress through informal discussions with the instructor(s), department head or college dean. If the instructor believes that the infraction is sufficiently serious to warrant referral to the Office of Conduct Standards, or if the instructor awards a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures governed by Penn State Senate Policy 49-20. Policy 49-20 and procedures can be found in the document “Policy and Rules for Students” issued annually by the Senate Office and available through each student's home department or college dean's office. Academic Integrity policy information can also be found on the web at http://www.engr.psu.edu/CurrentStudents/acadinteg.asp

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