

# BIOEN 6430/NEUSC 6050 *Systems Neuroscience*

## Course Description and Syllabus

Spring 2019

Gregory A. Clark

v181231-1223-gac\_Canvas01

<b>Course Director:</b>	Gregory Clark: <a href="mailto:Greg.Clark@utah.edu">Greg.Clark@utah.edu</a> , 585-9796 (subject to change), 506 BPRB.
<b>Format:</b>	Lecture, discussion
<b>Credit Hours:</b>	4
<b>Text:</b>	Kandel et al., <i>Principles of Neuroscience</i> (5 <sup>th</sup> ed), 2013. New York: McGraw Hill. ISBN 978-0-07-139011-8. (Pdf version is also available.) Also, papers for discussion to be assigned from the primary scientific and engineering literature.
<b>Meeting:</b>	T,H 10:45 AM-12:05 PM (lecture): HSEB 2948 F 12:55 PM-1:45 PM (discussion): HSEB 2948
<b>Grading:</b>	One overall grade will be assigned for the course, based on performance in both lecture and discussion. Exams (lecture): ~75%. Assignments, presentation, and class participation (discussion): ~25%.
<b>Office Hours:</b>	Thu after class, or by appointment.

### Course Description & Objectives

**BIOEN 6430/NEUSC 6050 *Systems Neuroscience*** (4) Cross-listed.

The nervous system exhibits an extraordinary capability for information processing, storage, and acquisition, much of which emerges from the interactions of systems of neurons. This course will explore systems-level functions and dysfunctions of the nervous system from a scientific and engineering perspective, beginning with issues of sensory coding and motor control, and expanding into issues of homeostasis, arousal, cognitive and mood disorders, and experience-dependent modifications of neuronal operations. Lectures will consist primarily of lectures by the faculty. Discussions sections will consist primarily of student-led discussion of primary literature associated with lecture topics.

### STUDENT CONTACT INFORMATION

So that I am able to contact you, please

- 1) Set your UU e-mail account so that it is the account that you actually use and check, or so that it forwards emails to the account that you actually use and check.
- 2) Set the options in your Canvas account to forward the Canvas emails to whatever email account you normally use and check.

Contacting Greg Clark directly via email or otherwise (instead of through Canvas) is usually more efficient for time-sensitive responses.

### CANVAS POSTINGS

Many course materials will be posted on the University's Canvas site, including papers for discussion, and most lecture notes. I will often e-mail you from the Canvas system to inform you of postings so that you don't have to keep checking. Appropriate settings will allow you to be notified automatically.

On Canvas, both BIOEN 6430/NEUSC 6050 cross-listings will be subsumed under a single Canvas site/course. Having a single, combined section on Canvas allows interactions among all students and avoids differences in postings, so that we can all be part of the same course.

GAC typical file-naming conventions for Canvas are as follows.

**<##\_AaaBb\_yymmdd\_Cc\_Dd\_vyymmdd-hhmm-aut\_Gg.\*>**, where

"##" = Session number

"AaaBb" = Meeting type: Lecture ("Lec") or Discussion ("Dis"), plus associated number (e.g., 01, 02, 03...)

“yymmdd” = Session meeting date (year-month-day, to allow chronological sorting)  
“Cc” = File content type; e.g., “HW” = homeworks; “LN” = lecture notes (Word-type documents); “LS” = lecture slides (PowerPoint-type documents); “MI” = miscellaneous other handouts; “RD” = reading; plus others as appropriate  
“Dd” = Abbreviated topic title  
“vyymmdd-hhmm-aut” = Version: date-time-author.  
“Gg” = Miscellaneous (optional)  
**Example:** <01\_Lec01\_180109\_LS\_Intro\_v170108-1432-gac.pdf> translates into  
“Session01\_Lecture01, Date: 2018-Jan-09\_File type: Lecture Slides\_Abbreviated Title: ‘Intro’\_Version: v2018-Jan-08, 2:32 PM, by G. A. Clark”

## **COURSE GUIDELINES**

The course will be conducted according to the policies and procedures of the College of Engineering (COE), [https://www.coe.utah.edu/wp-content/uploads/pdf/faculty/semester\\_guidelines.pdf](https://www.coe.utah.edu/wp-content/uploads/pdf/faculty/semester_guidelines.pdf).

## **STUDENTS, UNIVERSITY POLICY, AND THE ADA**

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the [Center for Disability Services](#), 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

## **ACADEMIC CONDUCT**

All students in this course, regardless of the cross-section in which they are enrolled, are required to read and agree to the Department of Biomedical Engineering Policy Statement of Academic Misconduct and to sign the associated Student Acknowledgment Form. All work for this course, including exams, assignments, and presentations, must be completed in keeping with the University of Utah Policy 6-400: Code of Student Rights and Responsibilities (“Student Code”), available at <http://regulations.utah.edu/academics/6-400.php>.

As defined in the Student Code (section I.B.),

*“Academic misconduct” includes, but is not limited to, cheating, misrepresenting one’s work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined further below [see Student Code]. It also includes facilitating academic misconduct by intentionally helping or attempting to help another student to commit an act of academic misconduct.”*

A primary example of academic misconduct is plagiarism: submitting as one’s own, work that is copied from an outside source. Other examples include cheating, such as copying from another student’s examination, or sharing or studying from past exams that were not meant for public distribution; and fabrication or falsification of information, such as fabricating data for a laboratory report or class project.

Science and engineering strive to uncover truth, discover new approaches, and create novel inventions and scholarship. Academic misconduct is antithetical to these goals, as well as to the goal of mastering new materials and skills. Academic misconduct will not be tolerated in this course, just as it is not tolerated in a professional scientific or engineering setting.

Academic misconduct may result in reduced grades and/or disciplinary action and written notification to the student’s home Department, College and/or Program, as well as dismissal from the Biomedical Engineering Department, particularly in cases of repeat occurrences.

## **COURSE CONTENT ACCOMMODATIONS POLICY**

The University Accommodation Policy can be found here, Accommodation Policy (Section Q): <http://regulations.utah.edu/academics/6-100.php>.

The University’s Office of General Counsel recommends use of a disclaimer if a faculty member has reason to believe a course content accommodation request might arise. Accordingly, please note the

following:

*"Some of the writings, lectures, films, readings, activities, presentations, or other content in this course may include material that conflicts with the core beliefs of some students. Please review the syllabus carefully to see if the course is one that you are committed to taking. If you have a concern, please discuss it with the relevant faculty instructor at your earliest convenience."*

According to the University, not all changes to course content trigger the use of the Accommodations Policy. Only student requests for accommodations based on conflict with sincerely-held core beliefs trigger the use of the policy. Thus, for example, instructors continue to be able to make modifications to course content for pedagogical reasons, such as adding or substituting new readings.

This course will be conducted in accord with the following, which has also been adopted by the Bioengineering Department:

*"None of the following, either singularly or in combination, is sufficient grounds for requesting a content accommodation:*

- a. personal disagreement with legitimate course content or its implications;*
- b. conflict between a student's beliefs and legitimate course content or its implications;*
- c. any burden imposed on a student's beliefs by legitimate course content or its implications.*

*Accommodations requested on such grounds, either singularly or in combination, will not be granted."*

### **ADDRESSING SEXUAL MISCONDUCT**

Violence or harassment based on sex or gender (which includes sexual orientation and gender identity/expression) are civil rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

### **WELLNESS STATEMENT**

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources, you should contact the Center for Student Wellness - [www.wellness.utah.edu](http://www.wellness.utah.edu); 801-581-7776.

### **CHANGES TO SYLLABUS**

The enclosed information represents a plan, not a contract. Topics, dates, and assignments and other content are subject to change at instructors' discretion.

## Syllabus, BIOEN 6430/NEUSC 6050 Systems Neuroscience

Session	Topic	Reading/ Assignment
	Week 1	
01. T 1/08	Lec01. Systems Neuroscience: Overview & Selected Principles (Greg Clark, GC)	Kandel et al. (*K) 1; 60.*
02. H 1/10	Lec02. Somatosensory 1: Transduction and Peripheral Mechanisms (GC)	K 16; 21; 22
03. F 1/11	Dis01. Introduction & Organization; Somatosensory (GC)	TBA
	Week 2	
04. T 1/15	Lec03. Somatosensory 2: Central Mechanisms (GC)	K 17:370-384; 23; 66:1483-1484
05. H 1/17	Lec04. Somatosensory 3: Central Mechanisms (GC)	K 24
06. F 1/18	Dis02. Somatosensory (GC & student TBA)	TBA
	Week 3	
07. T 1/22	Lec05. Vision 1: Phototransduction and Retinal Information Processing (GC)	K 25; 26
08. H 1/24	Lec06. Vision 2: Central Pathways & Developmental Plasticity (Alessandra Angelucci, AA)	K 27; 56:1259-1275
09. F 1/25	Dis03. Vision (AA & student TBA)	TBA
	Week 4	
10. T 1/29	Lec07. Vision 3: Higher-Order Visual Processing	K 20:433-437; 28; 29 or TBA
11. H 1/31	Lec08. Auditory and Vestibular 1: Transduction & Peripheral Mechanisms (GC)	K 30; 31; 40 (to be cont'd)
12. F 2/1	Dis04. Audition. (GC & student TBA)	TBA
	Week 5	
13. T 2/05	Lec09. Auditory and Vestibular 2: Central Processing (GC)	K 30; 31; 40 (cont'd); 56 (cont'd):1275-1283
14. H 2/07	Lec10. Taste &/or Olfaction (Matt Wachowiak)	K 32
15. F 2/08	Dis05: Chemical Senses (MW, GC & student TBA)	TBA
	Week 6	
16. T 2/12	Lec11. Motor Systems 1; Muscle (GC)	K 33; 34
17. H 2/14	Lec12. Spinal Reflexes & Locomotion 1 (GC)	K 35; 36
18. F 2/15	Dis06: Motor Systems 1 (GC and student TBA)	TBA
	Week 7	
19. T 2/19	Lec13. Spinal Reflexes & Locomotion 2 (GC)	K 35; 36 cont'd
20. H 2/21	Lec14. Voluntary Control 1 (GC)	K 37; 38
21. F 2/22	Dis07. Motor Systems 2 (GC and student TBA)	TBA
	Week 8	
22. T 2/26	Lec15. Voluntary Control 2 (GC)	K 37; 38 cont'd
23. H 2/28	Lec16. Cerebellum (GC)	K 42
24. F 3/1	Dis08. Motor Systems 3 (GC & student TBA)	TBA
	Week 9	
25. T 3/05	Lec17. Basal Ganglia (GC)	K 43
26. H 3/07	Lec18. Student-led review	Review
27. F 3/08	Dis09. Independent Study	TBA
	<b>Spring Break, Mar 10-17 2019</b>	

Session	Topic	Reading/ Assignment*
	Week 10	
28. T 3/19	Lec19. <b>EXAM 1</b> on Sensory & Motor Systems	Review
29. H 3/21	Lec20. Overview of Regulatory, Modulatory, Motivational, & Emotion Systems (GC)	K 46:1038-1051; 48
30. F 3/22	Dis10. Regulatory (etc.) systems: (GC & student TBA)	TBA
	Week 11	
31. T 3/26	Lec21. Autonomic Nervous System (GC)	K 47
32. H 3/28	Lec22. Hypothalamus: Temperature, Sex (GC)	K 47 (cont'd); 49, 58
33. F 3/29	Dis11. ANS/Hypothalamus (GC & student TBA)	TBA
	Week 12	
34. T 4/02	Lec23. EEG, Circadian Rhythms (GC)	K 46:1038-1040 (repeat); Box 50-1; 51; Ch 3, p47; 51-53
35. H 4/04	Lec24. Epilepsy (Karen Wilcox)	K 50
36. F 4/07	Dis12. Epilepsy (GC, & student TBA)	TBA
	Week 13	
37. T 4/09	Lec25. Long-Term Potentiation & Long-Term Depression (GC)	K 67
38. H 4/11	Lec26. Long-Term Potentiation: Behavior (GC)	K 65:1441-1452; 67 (cont'd)
39. F 4/12	Dis13. EEG, Sleep, or LTP (GC & student TBA)	TBA
	Week 14	
40. T 4/16	Lec27. Learning and Memory: Systems (GC)	K 48 (repeat), 65 (partial repeat); 66:1478-1485
41. H 4/18	Lec28. Learning and Memory: Cellular (GC)	K 66:1461-1478
42. F 4/19	Dis14. Neural Mechanisms of Learning and Memory (GC & student TBA)	TBA
	Week 15	
43. T 4/23	Lec29. Mood & Thought Disorders or catch-up (GC)	K 60; 61; or TBA
44. T 5/1	<b>Lec30. Final Exam. 10:30-12:30. <u>Note different day &amp; time from usual class.</u> HSEB 2948. (Time &amp; place subject to change.)</b>	Review

\*\*K" refers to Kandel et al., Principles of Neural Science, 5<sup>th</sup> ed., 2013, followed by chapter number and page numbers, as appropriate. E.g., "K 1; 60" means Kandel et al., Chapters 1 and 60.

Additional readings or assignments may be given throughout the course. Schedule subject to change. Some or all notes and assignments may be posted on Canvas, or emailed, or handed out in class.