NEUR_BISC 408 Spring 2019 Systems Neuroscience: From Synapses to Perception

This lecture course is designed for upper-level undergraduate and early graduate students with an interest in Systems Neuroscience. The course will cover the sensory, motor, cognitive and behavioral state systems which together form the framework of the nervous system. The approach will consider basic concepts regarding the structural and functional organization of the brain: from the principles of neurotransmission, to microscopic arrangement of neural circuits, to integrative processes such as perception and learning. Readings will be drawn from a variety of source materials and will be posted to Blackboard prior to each lecture.

Instructors:

Sarah Bottjer (SWB)	HNB 218	bottjer@usc.edu
Bruce Yazejian (BY)	HNB B20	yazejian@usc.edu

Teaching Assistant: Lei Peng leipeng@usc.edu Office hours in BioSpace (ZHS 360A) M 5:30-6:30 (after discussion section), W 3:30-4:30 (after class) or by appointment.

Text (recommended): *Principles of Neural Science* Kandel and Schwartz; 5th edition ISBN-13: 978-0071390118

Lecture Times & Location: Mon & Wed 2:00-3:20 pm in ZHS 252

Office Hours for SWB, BY: Anytime by appointment, arranged via e-mail

Discussion times & Location
There are 2 discussion sections; see Schedule of Classes at http://classes.usc.edu/term-20191/classes/bisc/

Course materials (including PowerPoint slides), reading assignments and handouts will be posted on Blackboard (http://blackboard.usc.edu/) as they become available. Please check this site frequently for course information. We also encourage the use of online discussions among students via Blackboard.

Assignments and Grading*

10 quizzes @ 10 pts each		100 (12 quizzes; lowest 2 are dropped)
3 mid-term exams @ 100 pts each		300
1 final exam (cumulative)		150 (100 points for midterm 4 plus 50 points based on all material)
	Total	**550**

*The instructors may, at their discretion, weight the final grades according to class participation. You can therefore increase the probability of getting a higher grade by being proactive in terms of asking (relevant) questions in class and/or contributing to discussions.

Learning objectives: An important goal of this course is to encourage critical evaluation and independent thinking about scientific evidence and the conclusions one can draw from it. We want you to develop your skills of objective analysis not only as they apply to the function of the nervous system, but also in general. A further goal is to encourage conceptual thinking that brings together many diverse elements from small details (e.g., the parts of the nervous system or activity of individual neurons) to the big picture (the integrated nervous system as a function of the relations and integration of its component parts). These are skills that will serve you well in the future – not just during the time you are taking this course.

Exams: There will be four exams (3 mid-terms and 1 final as outlined above). There are no make-up exams. If exceptional circumstances prevent you from attending an exam, your reason for missing it must be accompanied by a written statement from a third party (e.g. a note from a medical doctor with contact information). Exams will be mixed format, including short-answer, fill-ins, etc.

Grading exams: Exams will be graded within the week after completion. You may request re-evaluation of the grade during the 7 days after the exam is returned. To do so, provide a typewritten explanation of your argument for a higher grade (explain clearly why you think your answer deserves more credit). Unless the instructor has made a mistake in tallying the grade, requests for additional credit are rarely successful.

Schedule may be updated as the semester progresses. Please note: most readings will be posted on Blackboard as PDF files or links. Check reading assignments on Blackboard for each lecture.

DATE	SUBJECT / LECTURER
Jan 7 MON (Lecture 1)	Introduction: expectations and goals of this class (BY & SWB)
Jan 9 WED (Lecture 2)	Overview of synaptic transmission (BY)
Jan 14 MON (Lecture 3)	Electrical properties of neurons, cable theory (BY)
Jan 16 WED (Lecture 4)	Driving forces, reversal potentials (BY)
Jan 21 MON	NO CLASS: Martin Luther King Day
Jan 23 WED (Lecture 5)	Neural coding and neural networks (BY)
Jan 28 MON (Lecture 6)	Neuromuscular junction: synaptic action, equivalent circuit (BY)
Jan 30 WED (Lecture 7)	Spinal reflexes, synaptic circuit analysis, alpha and gamma motor neurons (BY)
Feb 4 MON (EXAM 1)	**MIDTERM EXAM 1**
Feb 6 WED (Lecture 8)	Central pattern generators: lobster stomatogastric ganglion, other invertebrate preps (BY)
Feb 11 MON (Lecture 9)	Learning and Memory, invertebrate models (*Aplysia,* etc.) (BY)
Feb 13 WED (Lecture 10)	Synaptic changes underlying LTP & LTD I (BY)
Feb 18 MON	NO CLASS: President's Day
Feb 20 WED (Lecture 11)	Synaptic changes underlying LTP & LTD II (BY)
Feb 25 MON (Lecture 12)	Cognition: Spatial Cognition in the Hippocampus (BY)
Feb 27 WED (Lecture 13)	Hypothalamus and Behavior (BY)
Mar 4 MON (EXAM 2)	**MIDTERM EXAM 2**

Mar 6 WED (Lecture 14)	Auditory System: Auditory Cortex I (SWB)
Mar 11 MON	**Spring Break**
Mar 13 WED	
Mar 18 MON (Lecture 15)	Auditory System: Auditory Cortex II – Bats & Biosonar (SWB)
Mar 20 WED (Lecture 16)	Auditory Cognition & Perception: Speech & Language (SWB)
Mar 25 MON (Lecture 17)	Auditory System: Sound Localization (SWB)
Mar 27 WED (Lecture 18)	Vision 1: Visual Cortex (SWB)
Apr 1 MON (Lecture 19)	Vision 2: Object Perception (SWB)
Apr 3 WED (EXAM 3)	**MIDTERM EXAM 3**
Apr 8 MON (Lecture 20)	Motor Systems I: Cerebral Cortex (SWB)
Apr 10 WED (Lecture 21)	Motor Systems II: Basal ganglia (SWB)
Apr 15 MON (Lecture 22)	Motor Systems III: Cerebellum (SWB)
Apr 17 WED (Lecture 23)	BMIs: Brain-Machine Interfaces (SWB)
Apr 22 MON (Lecture 24)	Addiction (SWB)
Apr 24 WEDS (Lecture 25)	Vocal learning in songbirds (SWB)
May 6 MON, 2-4 pm	**FINAL EXAM**

Statement for Students with Disabilities: Students requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure to email your letter to both instructors as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday.
DSP Phone (213) 740-0776; DSP TTD (only) phone (213) 740-6948; DSP Fax (213) 740-8216
DSP Email: ability@usc.edu; DSP website: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html

Statement on Academic Integrity (from University Student Conduct Code section 11.00): *General principles of academic integrity include and incorporate the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Faculty members may include additional classroom and assignment policies, as articulated on their syllabus.*

For further information regarding appropriate student conduct, and the consequences of inappropriate conduct, students should refer to the Student Guidebook "SCAMPUS" http://scampus.usc.edu/. In particular the University Student Conduct code **section 10** (http://scampus.usc.edu/university-student-conduct-code/), **section 11** (http://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/), and **section 12** (http://scampus.usc.edu/1200-conduct-review-system/).