

NEUR_BISC 408 Spring 2022 Systems Neuroscience: From Synapses to Perception

Note this is a DRAFT SYLLAUBS subject to change.

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:

Andrew Hires (SAH) HNB 228 shires@usc.edu

Bruce Yazejian (BY) HNB yazejian@usc.edu

Text (optional): *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

Discussion / Office Hours for BY, SAH: Monday/Tuesday 4-5

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 written 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.

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Readings will be posted on Blackboard as PDF files or links. Check reading assignments on Blackboard for each lecture.

DATE	SUBJECT / LECTURE
Jan 10 MON (Lecture 1)	Introduction: expectations and goals of this class (SAH & BY)
Jan 12 WEDS (Lecture 2)	Synaptic Transmission (SAH)
Jan 17 MON (NO Class)	NO CLASS: Martin Luther King Day
Jan 19 WED (Lecture 3)	Electrical properties of neurons, cable theory (SAH)
Jan 24 MON (Lecture 4)	Driving forces, reversal potentials (SAH)
Jan 26 WED (Lecture 5)	Neural coding and neural networks (SAH)
Jan 31 MON (Lecture 6)	Neuromuscular junction: synaptic action, equivalent circuit (SAH)
Feb 2 WED (Lecture 7)	Spinal reflexes, synaptic circuit analysis, alpha and gamma motor neurons (SAH)
Feb 7 MON (Exam 1)	MIDTERM EXAM 1
Feb 9 WED (Lecture 8)	Central pattern generators (SAH)
Feb 14 MON (Lecture 9)	Learning and Memory, invertebrate models (<i>Aplysia</i> , etc.) (SAH)
Feb 16 WED (Lecture 10)	Synaptic changes underlying LTP & LTD I (SAH)
Feb 21 MON (No class)	NO CLASS: President's Day
Feb 23 WED (Lecture 11)	Synaptic changes underlying LTP & LTD II (SAH)
Feb 28 MON (Lecture 12)	Cognition: Spatial Cognition in the Hippocampus (SAH)
Mar 2 WED (Lecture 13)	Hypothalamus and Behavior (SAH)
Mar 7 MON (Exam 2)	MIDTERM EXAM 2
Mar 9 Wed (Lecture 12)	Auditory System: Sound Localization (BY)

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Mar 14 & 16	SPRING BREAK
Mar 21 MON (Lecture 13)	Auditory System: Auditory Cortex I (BY)
Mar 23 WED (Lecture 14)	Auditory System: Auditory Cortex II – Bats & Biosonar (BY)
Mar 28 MON (Lecture 15)	Auditory Cognition & Perception: Speech & Language (BY)
Mar 30 WED (Lecture 16)	Vision 1: Visual Cortex (BY)
Apr 4 MON (Lecture 17)	Vision 2: Object Perception (BY)
Apr 6 WED (Exam 3)	MIDTERM EXAM 3
Apr 11 MON	Motor Systems I: Cerebral Cortex (BY)
Apr 13 WED (Lecture 18)	Motor Systems II: Basal ganglia (BY)
Apr 18 MON (Lecture 19)	Motor Systems III: Cerebellum (BY)
Apr 20 WED (Lecture 20)	BMIs: Brain-Machine Interfaces (BY)
Apr 25 MON (Lecture 21)	Addiction (BY)
Apr 27 WED (Lecture 22)	Vocal learning in songbirds (BY)
May 9 MON, 2-4 pm	FINAL EXAM

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Statement for Students with Disabilities: Students requesting academic accommodations based on a disability are 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/academicssupport/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/>).

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.