

HCS/ACN 6346—Systems Neuroscience—Fall 2022

Ongoing Covid-19 Pandemic Edition (“live and in-person” Tues-Thurs 10–11:15 AM; Teams live also likely*)

Professor

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For Covid-19 info: <https://www.utdallas.edu/coronavirus/>

Prerequisites: Admission to the Cognition & Neuroscience doctoral/ACN master’s program, or permission of the instructor.

Course Description: Examines the collective behavior of neuronal systems with respect to motor control, sensory processing and regulation of more advanced functions.

Student Learning Objectives: After completing the course, students should be able to:

- 1.2 Describe and analyze the contributions of anatomical, physiological, behavioral, pharmacological, developmental, and cell and molecular biological studies to the bases of neuroscience, and:
 - c) describe the principles of (1) feedback, (2) reciprocal connectivity, and (3) distributed processing fundamental to self-organizing neural systems,
 - d) describe neural mechanisms of (1) motor control, (2) sensory processing, (3) homeostatic maintenance, and (4) higher cognitive functions (including learning, memory and emotions),
 - g) describe the anatomical and functional organization of the autonomic nervous system and neuroendocrine systems.
- 2.1 Identify and explain why research questions drive advances:
 - a) describe and analyze common methods used to interpret neuronal function in current studies, and limits of these techniques,
 - c) describe and analyze use of different lesions (natural, accidental and induced) in nervous systems to infer function, & limits of these techniques,
 - f) describe and analyze non-invasive imaging techniques used to assess nervous system structure and function, and the temporal and spatial limits of these techniques compared to other available methodology.
- 2.2 Describe how current methods sometimes limit our understanding of the nervous system, and drive innovation to develop new and better methods.
- 2.3 Describe why multiple research techniques & multiple levels of analysis (systems, network, cellular, synaptic, etc.) are preferred to address basic questions in the neurosciences, not reliance on a single technique or level.
 - 3.1 Develop skills in orally presenting scientific research orally to your peers.
 - 30.1 Describe basic components of the laws of nature developed in this course.
 - 30.2 Evaluate & critique studies published in the scientific literature. Demonstrate ability to orally present scientific research to your peers.
 - 30.3 Make and defend reasoned arguments about major scientific issues.

A course in the neurosciences aims at a constantly moving target. This course covers three core areas of neuroscience: (1) cellular properties of different types of neurons that suit them to (and/or limit) the specific tasks they carry out; (2) organization of functional neural systems that determine the behavioral and cognitive properties of living organisms; (3) critical evaluation of the research methods used to assess (1) and (2). The aim is to familiarize you with systems analyses of brain function. You will be trained to critically evaluate current and future theories that purport to do so.

Text (required): *Neuroscience (Purves et al.), 6th Ed. – 1 ea.*

Course Platforms: eLearning (asynchronous) will serve as an adjunct for posting material. Live class meetings will be posted on Teams™ as needed. Masked attendance of lectures is **strongly recommended**. *It is NOT possible to complete the course asynchronously, unless advised by the Dean of Students Office. Please see <https://go.utdallas.edu/syllabus-policies> for guidance. **Masking, de-densification and/or any other needed updates will**

be discussed at our first meeting, i.e. August 23. Please attend.

Graded evaluations will be conducted online: There will be three (3) exams given on specified dates via eLearning, each worth 25 points toward your final grade (a total of 75 points). The format of the exam questions is designed to be challenging and to encourage integrative thought. Additional assigned readings will inform the oral presentations, i.e. everyone should read the papers selected by your peers. Master’s students will make one (1) oral presentation on a topically-related peer-reviewed research paper; doctoral students will make two (2) oral presentations, with a different focus for each. These oral presentations will be peer-reviewed, to earn an additional 20% of your grade (20 points total). The final 5% of your grade (5 points) will be based on your participation—i.e. you earn these 5 points by being routinely and actively engaged in the class (i.e. participating in class discussions and MOST PARTICULARLY by participating in the peer review process for ALL of the oral presentations).

Grading Grading is based on a set of a priori criteria: 90 points for A’s, 80 for B’s, 70 for C’s, and 60 for D’s. Grades are based on the total number of points earned across the course.

Expectations Class begins promptly, so if you are late you may miss critical content. Excused absences for exams will be given only if: (a) you are seriously ill and have written documentation from a physician, or (b) you were detained by law at the exam time, or (c) *you made prior arrangements* w. the instructor to attend a verifiable event. In ALL of these cases except (b), you must notify the instructor at least 4 hr in advance of an exam by email; for (b), your court order/arrest record will suffice. Otherwise, you will receive a zero (0) for that exam. A maximum extension of one week (7 days) beyond the scheduled exam date can be granted. Oral presentations MUST be made when scheduled.

I do not own copyright to graphics used in lectures, so please do not repost or share the material presented. Empirical research on memory formation, consolidation, and recall clearly demonstrates that complex information is optimally remembered if it is written down yourself rather than passively viewed (engaging/using more active portions of your brain’s memory subsystems), so take good notes, and go back and rewrite them while your memories are fresh! When in doubt, **form a study group** and discuss in depth with your peers.

All grades/exam feedback will be posted on eLearning; please review them in a timely fashion. Your instructor will also answer questions in class afterwards. **On exam days, UT Dallas’s code of ethics applies—YOU ARE ON YOUR HONOR to not refer to notes, videos, texts, recordings, or any other external aids while taking your exam. Exams must be completed within a single timed session, so plan accordingly.**

Class schedule

(subject to change at the discretion of the instructor, the dictates of science and/or of notoriously unpredictable Texas politicians or weather events)

Date	Topic	Readings suggested
Aug. 23	Introduction to neural systems etc.	(review Chap. 1-3)
25	Motor systems I: motor units and ANS	Chap. 16
30	Motor systems II: spinal cord	Chap. 17
Sept. 1	Motor systems III: descending systems	Chap. 17
6	Motor systems IV: basal ganglia	Chap. 18
8	Motor systems V: cerebellum	Chap. 19
13	Exam 1: Motor systems	
15	ORAL PRESENTATIONS 1 (5 + 2 min talks)	~10 papers: see eLearning
20	ORAL PRESENTATIONS 2 (5 + 2 min talks)	~10 papers: see eLearning
22	Sensory systems I: somatic I	Chap. 9
27	Sensory systems II: somatic II	Chap. 10
29	Sensory systems III: visual I	Chap. 11
Oct. 4	Sensory systems IV: visual II	Chap. 12
6	Sensory systems V: auditory/vestibular	Chap. 13-14
11	Sensory systems VI: chemical	Chap. 15
13	Exam 2: Sensory systems	
18	ORAL PRESENTATIONS 3 (5 + 2 min talks)	~10 papers: see eLearning
20	ORAL PRESENTATIONS 4 (5 + 2 min talks)	~10 papers: see eLearning
25	Homeostatic systems I: eating & drinking I	Chap. 21
27	Homeostatic systems II: eating & drinking II	Chap. 21
Nov. 1	Homeostatic systems III: sleep & waking	Chap. 28
3	Homeostatic systems IV: sleep & waking	Chap. 28
8	Homeostatic systems V: emotion & motivation	Chap. 31
10	Homeostatic systems VI: sex & language	Chap. 33, 24
15	Exam 3: Homeostatic systems	
17	ORAL PRESENTATIONS 5 (5 + 2 min talks)	~10 papers: see eLearning
22, 24	FALL BREAK/THANKSGIVING	No classes
29	ORAL PRESENTATIONS 6 (5 + 2 min talks)	~10 papers: see eLearning
Dec 1	Doctoral Research oral presentations 1 (10 + 2 min talks)	*4 Ph.D. students see eLearning

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus:

Please go to <https://go.utdallas.edu/syllabus-policies> for these policies