

ACN/HCS 6340.501 CELLULAR NEUROSCIENCE — FALL 2016

TUESDAY & THURSDAY 7:00 PM – 8:15 PM CRA FN 12.120

Instructor Contact Information

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Office hours: Tuesday and Thursday after class, or by appointment.

Course Description:

Purpose of the course is to supply the basic notions in the field of cellular neuroscience, and the intellectual tools for understanding recent advances of the molecular and cellular events underlying neural signaling, synaptic transmission and plasticity. To this end the basic morphology and functions of neurons and glia, describing cytology of subcellular organelles in neuronal cells, familiarizing the students with electric neuronal models, and illustrating as examples the neuromuscular junction, central synapses, synaptic integration and plasticity.

Prerequisites: None

Student Learning Objectives:

After completing the course, students should be able to:

- Describe and analyze the contributions of anatomical, physiological, behavioral, pharmacological, and molecular biological studies to the bases of neuroscience,
- describe the basic morphology and functions of neurons and glia,
- use proper scientific terminology for neurotransmitters, neurotransmitter receptors, and neurotransmitter receptor/effector signaling systems,
- describe the cytology of subcellular organelles in neuronal cells,
- work with models describing electrical activity of neurons, particularly the role of ion channels in maintaining and altering neuronal membrane potential,
- describe mechanisms of synaptic transmission and synaptic plasticity induced by experience,
- describe and analyze neurophysiological recording methods used to assess neuronal activity, and limits of these techniques.

Required Textbook and Materials:

- D. Purves et al., (eds) *Neuroscience* 5th (or 4th) edition (2012) ISBN-10: 978-0-87893-695-3 (**required**).
- Also **recommended**: E.R. Kandel, J.H. Schwartz, and T.M. Jessell (eds) *Principles of Neural Science* (2012) ISBN-10: 9780071390118.

Elearning:

To comply with FERPA regulations, all email discussions to and from me **MUST** be through elearning. This is to protect your privacy. Grades will be posted as soon as they are available. Announcements will be made in class.

Exams and Assignments:

Exams: Students will be evaluated with 3 tests during the semester, a comprehensive final exam, and an oral presentation. Tests will consist of multiple choice questions and short answer questions covering the preceding lessons. **Each Test will count 30 points toward the final grade, the Final Exam counts 60 points and the oral presentation counts 30 points for a total of 180 points** (see below).

Grading Policy: Grading is based on a set of a priori criteria: 90% (or 162+ points) correct for A (A- = 162-168 pts.; A = >169 pts.), ~80% (or 144+ points) for B (B- = 144-149 pts.; B = 150-155 pts.; B+ = 156-161 pts.), ~70% (or 126+ points) for C (C- = 126-131 pts.; C = 132-137 pts.; C+ = 138-143 pts.), and ~60% (or 108+ points) for D (D- = 108-113 pts.; D = 114-119 pts.; D+ = 120-125 pts.), less than ~60% (108 points) is automatically an F. The instructor reserves the right to change the evaluation criteria (grade brackets) at his discretion, even from test to test. No extra tests will be available.

Course and Instructor Policies

Attendance of classes is strongly recommended, as tests will be based on material taken from the classes and will not be restricted to the topics and textbooks indicated in this syllabus, which serves predominantly as a guideline to the course. Finally, the instructor reserves the right to adjust the final grade based on the student's participation in the class-room. Excused absences for exams will be given only if: (a) you are seriously ill and have verifiable documentation from a physician, or (b) you were detained by law at the exam time, or (c) you made prior arrangements to attend a verifiable religious or family event. In ALL of these cases except (b), you must notify the instructor in advance of the scheduled exam by email; for (b), your court order 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, except for the final exam, which must be taken on the final exam date. Please **DO NOT** make early travel arrangements during Finals week!

DATE	TOPIC	ASSIGNMENTS
Tue Aug. 23	Introduction	Purves Ch. 1; Kandel Ch. 1
Thurs Aug. 25	Structure of neurons	Kandel Ch. 2, 4
Tue Aug. 30	Glia and Neurons	
Thurs Sept. 1	No Class – ISBRA/ESBRA	
Tue Sept. 6	No Class – ISBRA/ESBRA	
Thurs Sept. 8	No Class– ISBRA/ESBRA	
Tue Sept. 13	Membrane Potential	Purves Ch. 2; Kandel Ch. 6
Thurs Sept. 15	Action potential	Purves Ch. 3; Kandel Ch. 7
Tue Sept. 20	Action potential	Purves Ch. 3; Kandel Ch. 7
Thurs Sept. 22	Passive membrane properties	Purves Ch. 2; Kandel Ch. 8
Tue Sept. 27	Test 1	
Thurs Sept. 29	Ion channels and transporters	Purves Ch. 4; Kandel Ch. 5
Tue Oct. 4	Synaptic transmission	Purves Ch. 5; Kandel Ch.8, 9
Thurs Oct. 6	Synaptic transmission	Purves Ch. 5; Kandel Ch.10, 12
Tue Oct. 11	Neurotransmitters and their receptors	Purves Ch. 6; Kandel Ch. 13
Thurs Oct. 13	Neurotransmitters and their receptors	Purves Ch. 6; Kandel Ch. 13
Tue Oct. 18	Activity in neuronal networks	Kandel Ch. 50
Thurs Oct. 21	Test 2	
Tue Oct. 25	Student Presentations	1 – Hu et al., 2009 (tbd); 2 – Magee and Cook, 2000 (tbd); 3 – Waters and Helmchen, 2004 (tbd)
Thurs Oct. 28	Student Presentations	4 – Szabadics et al., 2006 (tbd); 5 – Brown et al., 2003 (tbd); 6– DiCastro et al., 2011 (tbd)
Tue Nov. 1	Student Presentations	7 – Hua et al., 2011 (tbd); 8 – Watanabe et al., 2014 (tbd) 9 – Sohal et al., 2009 (tbd)
Thurs Nov. 3	Molecular Signaling within Neurons	Purves Ch. 7; Kandel Ch. 11
Tue Nov. 8	Molecular Signaling within Neurons	Purves Ch. 7; Kandel Ch. 11
Thurs Nov. 10	Molecular Signaling within Neurons	Purves Ch. 7; Kandel Ch. 11
Tue Nov. 15	synaptic plasticity (LTP – LTD)	Purves Ch. 8; Kandel Ch. 66, 67
Thurs Nov. 17	synaptic plasticity (LTP – LTD) - STDP	Purves Ch. 8; Kandel Ch. 66, 67
Tue Nov. 22	Test 3	
Thurs Nov. 24	No class – Thanksgiving break	
Tue Nov. 29	Student Presentations	10 – Evans et al., 2013 (tbd); 11 – Polsky et al., 2009 (tbd); 12 – Watt et al., 2004 (tbd)
Thurs Dec. 1	Student Presentations	13 – Lee et al., 2009 (tbd); 14 – Redondo et al., 2009 (tbd); 15 – Sjoestroem and Hausser, 2006 (tbd)
Tue Dec. 6	Student Presentations	16 (a and b) – Navakodde et al., 2010 and Volk et al., 2013 (tbd) 17 – Harvey and Svoboda, 2007 (tbd); 18 – Yizhar et al., 2011 (tbd)
Dec. 9 -15	FINAL comprehensive Exam	

Schedule:

This schedule is *tentative*. There may be unforeseen outside factors (e.g. school closings due to inclement weather) that necessitate adjustments to this schedule, including the dates of reviews and tests. Any such adjustments will be announced in class and/or via e-learning. **All descriptions of the didactic material and the timelines are subject to change at the discretion of the instructor.** The information in the following link constitutes the University's policies and procedures segment of the course syllabus: Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.