

INTD 5040
FUNDAMENTALS OF NEUROSCIENCE I
MOLECULAR, CELLULAR, & DEVELOPMENTAL NEUROSCIENCE
SPRING 2017

CLASS DAYS and TIME: Tuesdays/Thursdays 8:00-10:00 a.m.

CLASSROOM: Long Campus, Basic Science Building 3.078V (Physiology Large Conference Room)

COURSE DIRECTORS: Drs. Eileen Lafer and Mike Beckstead

COURSE ADMINISTRATOR: Gloria Rodriguez (RodriguezG15@uthscsa.edu)

OFFICE LOCATION and HOURS: MED 415B (Lafer), STRF 207.5 (Beckstead)

EMAIL: lafer@uthscsa.edu, beckstead@uthscsa.edu

TELEPHONE: x73764 (Lafer), x24046 (Beckstead)

READ THIS DOCUMENT CAREFULLY - YOU ARE RESPONSIBLE FOR ITS CONTENTS.

COURSE DESCRIPTION AND OBJECTIVES

This course is intended to introduce students to a broad survey of the basics of molecular, cellular and developmental neuroscience. The course is organized into a series of two modules: Cellular and Molecular Neuroscience, and Signalling and Developmental Neuroscience, which covers the fundamentals of these two areas. Current topics and concepts are discussed in discussion sessions that include student participation. Two components; Neuroscience students register for both PHYL 5041 and INTD 5040.

Pre-requisites – PHYL 5041 (Excitable Membranes) is a co-requisite, and the course is designed to transition from PHYL 5041 to INTD 5040 in the same time slot. The PHYL 5041 co-requisite is **required for Neuroscience students**, but other students may take INTD 5040 without PHYL 5041 with permission from a course director (Dr. Lafer or Beckstead). While there is no specific pre-requisite, some prior neuroscience knowledge is required to comprehend this material. Please obtain the permission from Dr. Lafer or Dr. Beckstead in advance of registering for this course.

Semester credit hours – 2 credit hours

By the end of this course, each student should be able to:

- Describe in detail the fundamental molecular, cellular, and developmental factors that collectively determine neuronal and circuit function in the brain.
- Formulate realistic, hypothesis-based experiments to address scientific questions concerning molecular, cellular, and developmental neuroscience.
- Evaluate and assess scientific literature related to molecular, cellular, and developmental neuroscience.

COURSE ORGANIZATION

The main teaching modalities used in this course include:

- 1) Textbook readings and didactic lectures will be used to introduce factual material
- 2) Paper discussions will be used to help the students integrate knowledge with relevant literature

Materials – **Textbook Reading Assignments** are listed on the class schedule. Please read the assigned material before

attending the lecture. **Slides** for each lecture will be available through CANVAS up to three days prior to lectures. Hard copies will not be provided. **Papers for discussion** will be available through CANVAS up to one week prior to its discussion.

Computer Access – CANVAS access is required for course materials and the exams. Print copies of slides and other materials will not be provided to the students.

Reading Assignments – Please refer to the class schedule for readings.

ATTENDANCE

Students are required to attend every lecture and paper discussion. If you are ill and unable to attend a class period, you **MUST** contact, in advance and by email, one of the course directors (lafer@uthscsa.edu, beckstead@uthscsa.edu) to be excused.

TEXTBOOKS

Recommended: The major textbook for the course is Squire et al. 4th edition (i). Readings in Byrne & Roberts 2nd edition (ii) and Byrne et al. 3rd edition (iii) are required for selected lectures. We suggest that you purchase Squire (available to buy or rent from amazon), which will also be used in Fundamentals of Neuroscience II, although copies are on reserve in Briscoe library. Byrne and Roberts is also on reserve in the library, and we will provide you with selected scanned chapters of both Byrne et al. texts on CANVAS. Readings from the scientific literature will be assigned and distributed through CANVAS.

i) Fundamental Neuroscience; 4th edition, Eds. Squire et al.; Academic Press, 2012,

<http://www.amazon.com/Fundamental-Neuroscience-Fourth-Edition-Squire/dp/0123858704>

ii) From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience; 2nd edition, Eds. Byrne J

& Roberts J; Academic Press, 2009. http://www.amazon.com/Molecules-Networks-Second-Introduction-Neuroscience/dp/0123741327/ref=sr_1_10?s=books&ie=UTF8&qid=1359428204&sr=1-10&keywords=roberts+neuroscience

[10&keywords=roberts+neuroscience](http://www.amazon.com/Molecules-Networks-Second-Introduction-Neuroscience/dp/0123741327/ref=sr_1_10?s=books&ie=UTF8&qid=1359428204&sr=1-10&keywords=roberts+neuroscience)

iii) From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience; 3rd edition, Eds. Byrne

et al.; Academic Press, 2014. [http://www.amazon.com/From-Molecules-Networks-Third-](http://www.amazon.com/From-Molecules-Networks-Third-Edition/dp/0123971799/ref=pd_cp_b_0)

[Edition/dp/0123971799/ref=pd_cp_b_0](http://www.amazon.com/From-Molecules-Networks-Third-Edition/dp/0123971799/ref=pd_cp_b_0)

GRADING POLICIES AND EXAMINATION PROCEDURES

Your final grade will be based on the arithmetic average of two take home exams. These exams will be distributed through CANVAS and must be returned through CANVAS. You will be given seven days to return the exam. As there are only two exams there are no make-ups, and if an exam is turned in late it will be subject to a 10% penalty for each day that it is late. Students may petition the course directors to extend the deadline without penalty, but waivers are only granted due to extraordinary circumstances such as documented illness.

Grading System

The final grading scale will be at least as generous as the one listed below. In some past years the final distribution of grades has been used as justification to curve grades to the students' benefit up to 5%.

A = 90-100% B = 80-89% C = 70-79% F = < 69%

REQUESTS FOR ACCOMMODATIONS FOR DISABILITIES

In accordance with policy 4.2.3, **Request for Accommodation Under the ADA and the ADA Amendments Act of 2008 (ADAAA)**, any student requesting accommodation must submit the appropriate request for accommodation under the American with Disabilities Act (ADA, form 100). to his/her appropriate Associate Dean of their School and a copy to the ADA Coordinator. Additional information may be obtained at <http://uthscsa.edu/eeo/request.asp>.

ACADEMIC INTEGRITY AND PROFESSIONALISM

Any student who commits an act of academic dishonesty is subject to discipline as prescribed by the UT System Rules and Regulations of the Board of Regents. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an exam for another person, signing attendance sheets for another student, and any act designed to give unfair advantage to a student or the attempt to commit such an act. Additional information may be obtained at <http://catalog.uthscsa.edu/generalinformation/generalacademicpolicies/academicdishonestypolicy/>

TITLE IX AT UTHSCSA

Title IX Defined:

Title of the Education Amendments of 1972 is a federal law that prohibits sex discrimination in education. It reads “no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.”

University of Texas Health Science Center San Antonio’s Commitment:

University of Texas Health Science Center San Antonio (UTHSCSA) is committed to maintaining a learning environment that is free from discriminatory conduct based on gender. As required by Title IX, UTHSCSA does not discriminate on the basis of sex in its education programs and activities, and it encourages any student, faculty, or staff member who thinks that he or she has been subjected to sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to immediately report the incident to the Title IX Director.

In an emergency, victims of sexual abuse should call 911. For non-emergencies, they may contact UPD at 210-567-2800. Additional information may be obtained at <http://students.uthscsa.edu/titleix/>

EMAIL POLICY

As graduate students your goal should be to learn the material in depth and not simply well enough to pass the exams. If you are struggling with any aspect of this class or have any questions please do not hesitate to contact the directors or individual faculty members in person, by phone or over email. Due to conferences, out of town seminars, and grant deadlines please understand that email replies may not be immediate. During the exam period please direct inquiries to the course directors and administrator and do not contact individual faculty.

USE OF RECORDING DEVICES

Lectures may only be recorded with the permission of each individual instructor, **obtained in advance**. Please do not show up to class and ask if you can record that day’s lecture.

ELECTRONIC DEVICES

Cell phones should be turned off or put away during class. Computers and tablets may be used to follow along with slides, take notes, look up the occasional unfamiliar term, and perform other activities directly related to the course material.

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| WEEK | DATE | TITLE | Hrs | Assignment | Topic | Instructor |
|--|--------|-------|-----|------------|--|------------|
| Module I: Cellular and Molecular Neuroscience | | | | | | |
| Week 1 | Feb 21 | C1 | 2 | | Neuronal and glial cytology, Cajal's early work, multiple structures fit for different function, cell types. Neurovasculature: endothelial cells, blood brain barrier; Paper discussion | Roberts |
| | Feb 23 | C2 | 1 | | Energy Metabolism: glycolysis and ox. phos., blood flow, glial involvement, glycogen storage | Lechleiter |
| Week 2 | Feb 28 | C3 | 2 | | The Synaptic Vesicle Cycle I | Lafer |
| | Mar 2 | C3 | 2 | | The Synaptic Vesicle Cycle II Paper discussion | Lafer |
| Week 3 | Mar 7 | C5 | 2 | | Oxidative stress: causes, targets, and enzymatic repair after damage. Paper discussion | Ran |
| | Mar 9 | C5 | 2 | | Axonal Transport: mechanisms, fast vs slow, retrograde vs anterograde. Paper discussion | Kim |
| Week 4 | Mar 14 | | | | No Class (spring break) | |
| | Mar 16 | | | | No Class | |
| Week 5 | Mar 21 | C6 | 2 | | Neurotransmission I: biogenic amines: catecholamines and serotonin. | Paukert |
| | Mar 23 | C6 | 1 | | Paper discussion | Paukert |
| Week 6 | Mar 28 | C7 | 2 | | Neurotransmission II: Glu, Ach, GABA, Glycine Paper discussion | McMahon |
| | Mar 30 | | | | No Class (exam period) | |
| Module II: Signaling and Developmental Neuroscience | | | | | | |
| Week 7 | Apr 4 | | | | No Class | |
| | Apr 6 | S1 | 2 | | Brain injury and repair. Paper discussion | Lechleiter |
| Week 8 | Apr 11 | S2 | 2 | | Metabotropic Receptors: G-proteins, recycling, effector proteins, second messengers. | Clarke |
| | Apr 13 | S2 | 1 | | Paper discussion | Clarke |
| Week 9 | Apr 18 | S3 | 2 | | Synaptic Function: Presynaptic Excitability. | Kim |

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| | | | | | Paper discussion | |
| | Apr 20 | S4 | 2 | | Synaptic Plasticity: Facilitation, Augmentation, PTP. Paper discussion | Pugh |
| Week 10 | Apr 25 | | | | No Class (Experimental Biology conference) | |
| | Apr 27 | S5 | 2 | | Synaptic Plasticity: LTP and LTD. Paper discussion | Beckstead |
| Week 11 | May 2 | S6 | 2 | | Cell-Cell Interactions: Gap Junctions. Paper discussion | Nicholson |
| | May 4 | S7 | 2 | | Cell Fate and Neuronal Differentiation. Conserved Mechanisms of Cell Migration and Growth Cone Navigation I. | Eaton |
| Week 12 | May 9 | S8 | 2 | | Conserved Mechanisms of Cell Migration and Growth Cone Navigation II. Paper discussion | Eaton |
| | May 11 | S9 | 2 | | Topographic Maps and Developmental Remodeling: Chemoaffinity Versus Experience. Paper discussion | Eaton |
| Week 13 | May 16 | | | | | |
| | May 18 | | | | | |
| Week 14 | May 23 | | | | | |
| | May 25 | | | | | |