**NROSCI 1042: Neurochemical Basis of Behavior**

**Instructor:** Sara E. Morrison, Ph.D.

sara.morrison@pitt.edu

**Lectures:** Monday/Wednesday 4:00-5:15pm

A202 Langley Hall

**Office hours:** Tues. 3:00-4:00 pm, Fri. 11:00 am -12:00 pm, and by appointment

451 Langley Hall (on the bridge between Langley and Clapp)

**Texts:**

Students are not required to purchase a textbook for this course, but some parts of the course draw upon the following textbook, which is available for study at Langley library:

Eric J. Nestler, Steven E. Hyman, David M. Holtzman, and Robert C. Malenka. *Molecular Neuropharmacology: A Foundation for Clinical Neuroscience*. 3rd ed. McGraw-Hill.

We will also read and discuss selected primary research articles and reviews, which will be available as PDFs on the course website.

**Course description:**

Neurochemistry is the study of the many chemicals – neurotransmitters, neuromodulators, hormones, and more – that influence the brain and nervous system. This class will focus on understanding the role of various neurochemicals in normal (and some abnormal) behavior, from behaviors that seem simple – like eating and sleeping – to complex cognition and social behavior. After an initial unit on neurochemical structure, classification, and signaling pathways, we will segue into topics including sleep and circadian rhythms; sex and social status; reward pathways and addiction; and decision-making. We will also examine the neurochemical basis of selected psychiatric disorders.

**Grading structure:**

The following factors will contribute to your grade for this class:

Exam #1 15%

Exam #2 15%

Annotated bibliography 10%

Research proposal 25%

Final exam 25%

Article questions (ungraded)

and participation in discussions 10%

Prior to each discussion of a primary research article, you will (1) answer 4-5 questions about the article and (2) write down any questions or clarifications that you would like to address in our discussion. These will not be graded, and answers need not be “correct,” but they must show that you read and thought about the article. Article questions will be due on Courseweb at 10:00 pm the evening before each article discussion. I will also ask for volunteers to lead discussion on certain topics and on each figure; I expect each student to lead a portion of the discussion at least once.

The research proposal will be a short (3-4 page) paper on a behavioral and neurochemical topic that interests you. It will describe some background literature, set up a research question, propose at least one experiment to address the question, and discuss the possible results. To prepare for the research proposal, you will construct an annotated bibliography in which you will write short (one paragraph) descriptions of at least two primary research papers and one review article. Details of these assignments will be provided in separate handouts. All assignments will be graded on quality, not quantity, so don’t go overboard on length!

**Course policies:**

Attendance on paper discussion days is mandatory and counts as part of your participation grade. Otherwise, you will not be graded on attendance, but note that attendance at lectures is essential for success in this course. Lecture slides will be made available on the course website, but you will be missing important context if you study them in isolation. If you must be absent from lecture, it would be beneficial to come to office hours and/or ask for additional reading to learn what you missed.

Midterm exams will be relatively short and start at the beginning of class, so don’t be late! If you must miss a scheduled exam for a legitimate reason (e.g. illness), you must notify me by email in advance and arrange an alternate time to take the exam. Late assignments will receive the equivalent of one letter grade off for each day after the due date. If you are having difficulty completing the assignment – e.g., selecting a topic, finding research papers, or thinking of an experiment – please talk to me before it becomes a major roadblock. You will never be penalized for asking for help.

**Academic Integrity Policy:**

Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, noted below, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the quiz, exam, or paper will be imposed. (For the full Academic Integrity policy, go to www.provost.pitt.edu/info/ai1.html.)

**Disability Services:**

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890 / (412) 383-3346 (fax), as early as possible in the term. Disability Resources and Services will verify your disability and determine reasonable accommodations for this course.

**Email Communication Policy:**

Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. To forward e-mail sent to your University account, go to http://accounts.pitt.edu, log into your account, click on Edit Forwarding Addresses, and follow the instructions on the page. Be sure to log out of your account when you have finished. (For the full E-mail Communication Policy, go to www.bc.pitt.edu/policies/policy/09/09-10-01.html.)

**Schedule of topics and due dates:**

While the dates for exams, paper discussions, and assignment deadlines will remain the same, please note that the exact schedule of topics is subject to change.

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| DATE | TOPIC(S) |
| Aug. 26 | Introduction and review of neuron/synapse structure and function |
| Aug. 28 | Ligands and receptors, signal transduction mechanisms |
| Sept. 2 | NO CLASS – Labor Day |
| Sept. 4 | Principles of neurotransmission, begin excitatory and inhibitory amino acids |
| Sept. 9 | Excitatory and inhibitory amino acids |
| Sept. 11 | Paper discussion #1 |
| Sept. 16 | Widely projecting neurotransmitters: intro, dopamine |
| Sept. 18 | Widely projecting neurotransmitters: norepinephrine, serotonin, acetylcholine |
| Sept. 23 | Widely projecting neurotransmitters: histamine, orexin; begin neuropeptides |
| Sept. 25 | **Exam #1**; neuropeptides continued |
| Sept. 30 | Paper discussion #2 |
| Oct. 2 | Atypical neurotransmitters: purines, cannabinoids |
| Oct. 7 | Atypical neurotransmitters continued; neurochemical methods |
| Oct. 9 | NO CLASS – Yom Kippur (possible optional guest lecture) |
| Oct. 14 | Autonomic nervous system, neuroendocrine system, homeostasis |
| Oct. 16 | Sleep and wakefulness |
| FRI. OCT. 18 | **Annotated bibliography due by 10:00 pm** |
| Oct. 21 | Guest lecture TBA |
| Oct. 23 | Stress, anxiety, and fear |
| Oct. 28 | Paper discussion #3 |
| Oct. 30 | Fear and anxiety continued |
| Nov. 4 | Aggression, sex, and social status |
| Nov. 6 | **Exam #2**; sex continued |
| FRI. NOV. 8 | **Recommended: submit your proposal topic for feedback by this date** |
| Nov. 11 | Feeding and satiety |
| Nov. 13 | Paper discussion #4; introduction to reward processing |
| Nov. 18 | Reward processing, dopamine, and addiction |
| Nov. 20 | Behavioral addictions; Parkinson’s disease; intro to decision-making |
| Nov. 25 | NO CLASS – Thanksgiving break |
| Nov. 27 | NO CLASS – Thanksgiving break |
| Nov. 28 | Decision-making and executive function |
| MON. DEC. 2 | **Research proposals due by 10:00 pm** |
| Dec. 2 | Paper discussion #5 |
| Dec. 4 | Executive function and schizophrenia |
| WED. DEC. 11 | **FINAL EXAM 4:00 PM** |