Sample Syllabi – Subject to Change

Explorations in Neuroscience: Neurons, Behavior, and Beyond

COURSE INSTRUCTORSCHEDULEMegan McNulty, Ph.D.MTWRF 9am-3pm (w/lunch break 11:30am-1:00pm)

COURSE DESCRIPTION

How does the brain work, and how do changes in brain structure and function give rise to neurological conditions and deficits? Developing a deeper understanding of the brain has been deemed one of the 21st century's *Grand Challenges*, and this course will draw on different research methodologies to begin unraveling one of life's greatest mysteries. Through inquiry-driven investigations that include close examination of primary data, we will explore the mechanisms by which electrochemical and circuit activity in nervous systems give rise to sensation, perception, and behaviors including, but not limited to, movement, language production, spatial navigation, emotional responses, sleep, and learning and memory. Laboratory investigations will parallel those done in modern neuroscience research labs and include molecular (DNA and protein) sequence analysis, fluorescence microscopy of nervous tissue, and behavioral assays. Finally, through our tour through nervous systems across phyla, we will begin to illuminate insights into the evolution history and inner workings of our own brain.

COURSE OBJECTIVES By the end of the session, students should be able to:

1. explain how nervous systems across species are anatomically and functionally organized and describe how this organization emerges through embryonic development.

2. use comparative analysis of vertebrate and invertebrate systems to develop insights into the evolutionary history of nervous systems.

3. describe the molecular mechanisms by which neuronal circuits translate external stimuli into electrical and chemical signals and use the resulting information to initiate, maintain, and/or modify behavior.

4. describe experimental and other methodological approaches designed to address questions in neuroscience and discuss the strengths and limitations associated with those approaches.

5. interpret graphs or other representations of neurobiological data, and understand basic statistical tests when relevant to the field.

6. use primary and secondary scientific sources to investigate questions specific to the field.

7. critically evaluate clinical neurological cases to develop insights into nervous system function under physiological and pathological states.

COURSE WEBSITE: canvas.uchicago.edu Reading materials, lecture slides, assignment guidelines and general course announcements will be posted on this website for this course. To access this course, enter your CNetID and password, and click on the course link. Materials provided to students in this course, including those posted on this course website, are not to be posted on any other website or distributed in any other form.

REQUIRED TEXTBOOK/READINGS

Neuroscience: Exploring the Brain, 4th edition by M.F. Bear, B.W. Connors, and M.A. Paradiso (publisher: Wolters Kluwer/Lippincott Williams & Wilkins). This is meant to serve as a reference for additional reading on concepts covered in class. Earlier editions would also be acceptable.

Additional reading materials will be posted on Canvas.

GRADING COMPONENTS

Your final grade will be determined using the following weighted components:

Quizzes (lowest two dropped): 40% Laboratory assignments/reports: 30% Group project/presentation: 30%

A note about attendance, engagement, absences and makeup opportunities Success in this course depends on consistent attendance, timely arrival, and active participation during every session. Active participation does not just involve vocal participation during class discussions. Your level of engagement and attentiveness during all sessions will be assessed. Engaging in other activities unrelated to the course (e.g. texting, emailing, etc.) during the class session will negatively impact your learning. All absences are considered unexcused except under the most exceptional of circumstances, which must be brought to the instructor's attention in writing as soon as possible and may require further verification by an appropriate authority. With an unexcused absence, you will be unable to obtain credit for any missed in-class activities. If you miss class, it is your responsibility to go over the material covered in your absence.

ACADEMIC HONESTY

Academic dishonesty is not tolerated by the University of Chicago and will not be tolerated in this course. All of the work you submit is expected to be **in your own words** with appropriate attribution to all of your sources of information. You must also complete all assignments on your own, without consulting classmates, the TA, students not in the course, etc. A demonstrated case of academic dishonesty will result in a loss of credit and a report submitted to the Master of the Biological Sciences Collegiate Division and the Dean of Students office, at which point additional grading deductions and disciplinary measures may be taken. Please read all of the guidelines in your student manual regarding academic honesty and contact the instructor if you have any questions.

STUDENT DISABILITY ACCOMMODATIONS

If you require any accommodations for this course, please provide the instructor with a copy of your Accommodation Determination Letter (provided to you by the Student Disability Services office) as soon as possible so that you may discuss how your accommodations may be implemented in this course. The University of Chicago is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or think you may have a disability) and, as a result, need a reasonable accommodation to participate in class, complete course requirements, or benefit from the University's programs or services, you are encouraged to contact Student Disability Services as soon as possible. To receive reasonable accommodation, you must be appropriately registered with Student Disability Services. Please contact the office at 773-702- 6000/TTY 773-795- 1186 or disabilities@uchicago.edu, or visit the website at disabilities.uchicago.edu. Student Disability Services is located at 5501 S. Ellis Avenue.

TENTATIVE DAILY SCHEDULE

Notes: Schedule is subject to change. Schedule changes will be posted on Canvas and announced in class ahead of time.

Every day class is in session, lunch will take place from 11:30am-1:00pm. Prior to lunch (9:00-11:30am), students will be in lecture or lab as indicated below. After lunch (1:00-3:00pm), students will be in lab. With the exception of the first day, there will typically be a 5-10 minute break around 10am.

WEEK 1			
	Introduction to the course		
	General lab safety (BSLC Room TBA)	Neuroscience lab safety procedures	
		Introductory activity. asking questions about the brain	
	Organization of nervous systems		
	Research methods in neuroscience;	Introduction to microscopy: examining invertebrate and	
	Searching the neuroscience literature	vertebrate nervous systems	
	Nonyous system development/anatomy		
	Chick pervous system development	Quiz #1	
		Examining brain models/sheep brain: Virtual dissections	
	Molecular and cellular neurobiology: genes and proteins		
	Reading discussion: Genetic variations	Quiz #2	
	and neurodegeneration	Protein structure in nervous system function and	
		uisease	
	Molecular and cellular neurobiology: from genes to cells		
	Gene expression in the nervous system.	Quiz #3	
	part 1 (Microarray analysis)	Gene expression in the nervous system, part 2	
		(Fluorescence microscopy)	
WEEK 2			
	Molecular and cellular neurobiology: Neurotransmission,	Quiz #4	
	Case study analysis	Group project, part 1: Formulating research question	
	Molecular and cellular neurobiology: Neurotransmission,		
	part 2	Quiz #5	
	Model circuits and MetaNeuron	Group project, part 2: Searching the literature	
	simulations		
	Sensory physiology: from genes to perceptions	1	
	Case study analysis	Quiz#6	
		Sensing bitter taste: Receptor gene amplification: PCR	
	From sensation to complex behaviors		
	Studying behavior in C. elegans, part 1	Quiz #7	
		Sensing bitter taste: Gel electrophoresis and ExoSap	
		Reaction time	

Neuropharmacology and drug addiction		
Reading discussion: Epigenetics of drug addiction	Quiz #8 Studying behavior in <i>C. elegans</i> , part 2	
Lograing and momony		
Learning and memory		
	Work on group presentations	
Brain evolution	Quiz #10	
Primate cranial morphology	Taste receptor gene sequence analysis	
	Work on group presentations	