

UMBC UGC New Course Request: **BIOL 490: Chemical Communication and Brain Disorders**

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Proposed Effective Date: Spring, 2016

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COURSE INFORMATION:

Course Number(s)	490
Formal Title	Chemical Communication and Brain Disorders
Transcript Title (≤30c)	Chem. Commun. & Brain Disorders
Recommended Course Preparation	
Prerequisite NOTE: Unless otherwise indicated, a prerequisite is assumed to be passed with a "D" or better.	BIOL 303 and either BIOL 305 or BIOL 307, all to be passed with a "C" or better"
Credits	4
Repeatable?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Max. Total Credits	<small>4 This should be equal to the number of credits for courses that cannot be repeated for credit. For courses that may be repeated for credit, enter the maximum total number of credits a student can receive from this course. E.g., enter 6 credits for a 3 credit course that may be taken a second time for credit, but not for a third time. Please note that this does NOT refer to how many times a class may be retaken for a higher grade.</small>
Grading Method(s)	<input checked="" type="checkbox"/> Reg (A-F) <input type="checkbox"/> Audit <input type="checkbox"/> Pass-Fail

PROPOSED CATALOG DESCRIPTION (no longer than 75 words):

This course will allow students to develop an understanding of how neurons in the nervous system communicate using synapses, neurotransmitters and neuroactive compounds. In the context of brain disorders and their resultant defects in chemical communication, students will gain an appreciation for how neurons and neural networks react to internal and external stimuli and how their activity underlies brain function.

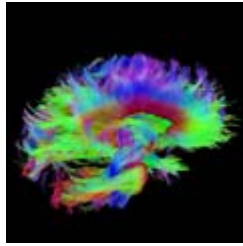
RATIONALE FOR NEW COURSE:

This course is being developed to provide advanced undergraduate students, who have a strong interest in neurobiology, a fundamental understanding of normal and disordered brain function in the context of current research. There is a growing interest among our undergraduate students in the etiology of various brain disorders and the pathophysiology that underlies them. This course will expose the students to such information, aiming to provide them a better conceptualization of how the central nervous system works and prepare them for potential future professional education. We plan to offer this course once per year. The course fits well with our department curriculum and covers a topical area that is central to a number of topics in neurobiology which have high relevance to the human experience. Additionally the demand for such courses which link neurobiology with behavior and psychology is high within our student body. The course will serve mostly senior and some junior undergraduates. This course is designed as upper elective course with course contents including current primary research literature in the field of neuroscience and is built on the basic knowledge provided in Molecular Biology of Cell (BIOL 303) and Animal or Human Physiology (BIOL 305 or BIOL 307). Without these pre-requisites, students will have a difficult time understanding the contents taught in the course. A regular grading method will be used because there are exams, homework assignments and classroom participation that will be evaluated. Because most of the students take this course in their senior year, it is unlikely they will have time to repeat the course before graduation since the course is offered yearly.

ATTACH COURSE OUTLINE (mandatory):

Syllabus and course schedule (time and contents) are attached.

BIOL 490: Chemical Communication and Brain Disorders SPRING 2016



Source: [The Human Connectome Project](#)

Introduction and Overview:

“With nearly 100 billion neurons and 100 trillion connections, the human brain remains one of the greatest mysteries in science and one of the greatest challenges in medicine. Neurological and psychiatric disorders, such as Alzheimer’s disease, Parkinson’s disease, autism, epilepsy, schizophrenia, depression, and traumatic brain injury, exact a tremendous toll on individuals, families, and society. If we are ever to develop effective ways of helping people suffering from these devastating conditions, researchers will first need a more complete arsenal of tools and information for understanding how the brain functions both in health and disease.” -- *NIH the brain initiative*

<http://www.braininitiative.nih.gov/why.htm>

Course Meeting Time:

Tuesday and Thursday: 1-3:50pm (or TBA).

Course Meeting Location:

BS 004 or TBA

Instructors:

Weihong Lin, Ph.D.

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E-Mail: weihong@umbc.edu

Office Hours: By appointment

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Office Hours: By appointment

Course Goals:

This course is designed to help you:

- Learn interesting and fundamental concepts about how various types of chemicals stimulate and modulate neuronal activity.
- Learn the receptors and pathways involved in chemical communication and regulation in the nervous system.
- Understand the basic changes in the chemical communication associated with various brain disorders.
- Develop an appreciation of the interaction between the environment and physiology in the context of mental health.
- Improve your level of confidence, skill, and comfort with reading primary scientific literature and data analysis.
- Improve critical thinking and reasoning skills during the discussion of scientific papers and analysis in a small group setting.
- Improve scientific communication skills through writing and giving oral presentations.

Course materials:

No specific textbook is required. Scientific literature (review and primary research articles) will be used. In this course you will read selected review articles and research papers within the field of neuroscience and write short answers to directed questions based on that literature (writing assignments). The purpose of this emphasis on reading and writing is to familiarize you with how scientists report their findings, and to help you learn how to communicate scientific knowledge to others. Strong scientific communication skills is an increasingly sought after asset for scientists and non-scientists. This course will help you hone that skillset.

You will read one research paper/week for the weeks those papers are assigned and we will discuss the paper on the following week. You will be assigned to discussion groups at the first session and you are required to read each paper before the class and be prepared to discuss it in class. Articles to be discussed in class will be available on Blackboard as .PDF files.

Evaluation:

- Exams (40%)
- Writing Assignments (40%)
- Class participation in discussion sessions (20%)

Exams:

The two major exams will consist of multiple choice questions that will be taken from the lectures. These exams are placed throughout the course to help assess your understanding of the core materials. Questions about the papers and discussions will not be a part of the two major exams. Please be advised that you may be asked to answer a few exam questions using a short answer and diagram as well.

Writing Assignments:

There will be 10 short writing assignments during the semester. Each writing assignment will be worth 4% of the final grade, for 40% total. Each writing assignment will consist of two short answer questions based on the reading and class discussion of the assigned paper. Writing assignments are due at the class immediately after the paper discussion. Late assignments will not be accepted for a grade.

Class participation:

Class participation in discussion sessions consists of two components:

1) Participating in your group and asking questions in class. We will discuss and analyze the week's scientific paper in small groups. Both the instructors and your peers will assess whether your contributions to the group are useful. If you haven't read the paper thoroughly, it will be impossible for you to make useful contributions. As others present the results to the class, we encourage you to ask questions with the aim of probing further, clearing up any confusion, or for any other reason.

2) Presenting the answers to your group's questions. After group discussion, one member of your group will be randomly selected to present the group's answers to the questions assigned to that group. Your presentation should indicate that you understand the relevant parts of the paper as well as your group's answer, and can explain it without using jargon. Your presentation should not be just reading notes from your notebook or computers.

For graduate students taking the course, you will have an additional component to the class participation and discussion grade:

Attendance at seminars. Graduate students (students taking the course as 6XX) will be required to attend the four scheduled seminars that are related to the course and

provide a one-page written report summarizing each talk. The summary will be due the next class period after the seminar.

Attendance policy:

In order to participate, you must be in class. For each unexcused absence your grade will be adjusted downward. Being late is also disruptive to the class, so three incidences of being late will count as one absence. We understand that there are legitimate reasons for missing class (illness, interviews, traveling sporting events). Please discuss these situations beforehand and we can arrange for you to make up the class.

Schedule of Topics

- (PA) = Paper assigned
- (WA) = Writing assignment due
- (DS) = Class discussion session

Date	Class #	Topic	Assignment	Lecturer
-	Block 1	Introduction to The Nervous System and Chemical Synapses		
	1	Introduction		Lin/Nestor
	2	Gross Neuroanatomy	PA1	Lin
	3	Introduction of molecules and chemical communication	PA2	Lin
	4	Chemical synapses	PA3	Lin
	5	Neurotransmitters	PA4	Nestor
	6	Receptors and Transporters	PA5	Nestor
	Block 2	Synaptic Transmission		
	7	Exam 1 + Glutamate Neurotransmission in the CNS	Exam 1/ PA6	Nestor
	8	Disease Focus: Epilepsy [DS]	WA1	Nestor
	9	GABAergic Neurotransmission in the CNS	PA7	Nestor
	10	Disease Focus: Autism [DS]		Nestor
	11	Long-Term Potentiation and Long-Term Depression	PA8	Nestor
	12	Disease Focus: Alzheimer's disease [DS]		Nestor
	13	Mitochondria and Neural Communication	PA9	Nestor
	14	Disease Focus: Parkinson's disease [DS]		Nestor
	Block 3	Extrasynaptic chemical communication		
		Exam 2 + Synaptic and Extrasynaptic Dopamine	Exam 2/ PA10	Nestor
		Disease Focus: Schizophrenia [DS]	WA2	Nestor

15	Cholinergic modulation	PA11	Lin
16	Centrifugal regulation from the basal brain [DS]		Lin
17	Oxytocin and vasopressin	PA12	Lin
18	Serotonin and depression [DS]		Lin
19	Marijuana & Opioids + Exam 3	Exam 3/ PA13	Lin
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Block 4	Communication with chemicals in the environment		
20	Olfaction	PA14	Lin
21	Olfactory disorders in neurodegenerative diseases [DS]		Lin
22	Pain	PA15	Lin
23	Modulation of pain [DS]		Lin
24	Review		Lin/Nestor
-	Exam 4 + WA 4 Due	EXAM 4/WA4	-