

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

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Proposed Effective Date: Spring, 2016

	Name	Email	Phone	Dept
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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	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.
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.

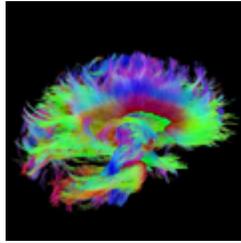
RATIONALE FOR NEW COURSE:

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.

Office: BS 211

Phone: 455-8674

E-Mail: weihong@umbc.edu

Office Hours: By appointment

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Phone: 443-860-2580 Ext 731

E-Mail: mnestor@hussmanautism.org

Office Hours: By appointment

Course Goals:

This course is designed to help students:

- 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. In this course you will read selected review articles and research papers within the field of neuroscience. There will be about 13 review and 11 research papers provided to students throughout the semester. These papers will help you to understand lecture materials on classic and current neuroscience research discoveries.

You will be required to write short review to some of these topics (see detail in Writing assignment). The purpose of this emphasis on reading and writing is to familiarize students with how scientists report their findings, critically evaluate published literature, 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.

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

Assessment:

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

Exams:

There will be four hour-long exams consisting of short answer questions and based on the material covered in the lectures and the paper discussion. These exams are placed throughout the course to help assess student's understanding of the core materials within each block.

Writing Assignments:

There will be four writing assignments. Each assignment will be based on the block materials that are covered. Each writing assignment will have approximately 1,000-1,200 words. You are required to search, read 2-3 research papers independently and write for these assignments. You should use the APA citation style to format the paper and references (<https://www.library.cornell.edu/research/citation/apa> & <https://owl.english.purdue.edu/owl/resource/560/01/>).

Two of the writing assignments will be short literature review and the other two will be commentary. Writing assignments 1 & 2 (WA 1 & WA 2 in the schedule of topics) will be commentary. Writing assignments 3 & 4 (WA 3 & WA 4 in the schedule of topics) will be a short literature review.

For the commentary, you should include a very short introduction and conclusion section and a critical review of the paper(s) they chose focusing on these questions:

- 1) Are the methods the authors use sufficient to answer the proposed hypotheses?
- 2) Are the conclusions the authors come to adequate?
- 3) What alternative interpretation of the results might be warranted?

For the short literature review students should include these sections: brief introduction, summary/review of the articles for the particular topic(s) (including what were the research themes, hypotheses, general research methods and results), conclusions, your thought on future studies and references. References do not count against word-count.

Your writing assignments will be peer reviewed by your discussion group before final submission to the instructors. This will give you a sense of the scientific process of peer review. Each writing assignment will be worth 10% of the final grade, for 40% total. The due dates of our peer-reviewed and revised writing assignments are listed in the schedule. 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. The research paper will be provided to you a week before the discussion. 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.

3) Attendance at seminars. Undergraduate students will be required to attend one of scheduled seminars that are related to the course and provide a one-page written report summarizing the talk. Graduate students (students taking the course as 690) will be required to attend the four scheduled seminars 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
- (RPD) = Research Paper Discussion
- Reading materials and research paper will be provided at least one week before the assigned time.

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	RPD1	Lin
5	Neurotransmitters	PA3	Nestor
6	Exam 1+ Receptors and Transporters	EXAM1 RPD2	Nestor
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Block 2	Synaptic Transmission		
7	Glutamate Neurotransmission in the CNS	WA1/PA4	Nestor
8	Disease Focus: Epilepsy	RPD3	Nestor
9	GABAergic Neurotransmission in the CNS	PA5	Nestor
10	Disease Focus: Autism	RPD4	Nestor
11	Long-Term Potentiation and Long-Term Depression	PA6	Nestor
12	Disease Focus: Alzheimer's disease	RPD5	Nestor
13	Mitochondria and Neural Communication	PA7	Nestor
14	Exam 2+ Disease Focus: Parkinson's disease	EXAM 2 RPD6	Nestor
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Block 3	Extrasynaptic chemical communication		
15	Synaptic and Extrasynaptic Dopamine	WA2/RA8	Nestor
16	Disease Focus: Schizophrenia	RPD7	Nestor
17	Cholinergic modulation	PA9	Lin
18	Centrifugal regulation from the basal brain	RPD8	Lin
19	Oxytocin and vasopressin	PA10	Lin
20	Serotonin and depression	RPD9	Lin
21	Exam 3+ Marijuana & Opioids	EXAM 3 PA11	Lin
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Block 4	Communication with chemicals in the environment		
20	Olfaction	WA3/PA12	Lin
21	Olfactory disorders in neurodegenerative diseases	RPD10	Lin
22	Pain	PA13	Lin
23	Modulation of pain	RPD11	Lin
24	Review		Lin/Nestor
-	Exam 4 + WA 4 Due	EXAM4/WA4	-