



BIOLOGICAL SCIENCES
FALL 2021
MOLECULAR NEUROBIOLOGY

Professor Jesus Angulo

BIOL 380-01 Mondays & Thursdays 1:10-2:25pm Online Synchronous
BIOL 380-02 Mondays & Thursdays 2:45-4:00pm Online Synchronous

Lectures will take place in Blackboard Collaborate and will be recorded. Lecture ppt slides will be posted in Blackboard. The lecture materials are protected by copyright. It is illegal to post on websites or any form of dissemination outside of Blackboard. A detailed week-by-week course schedule is provided in this syllabus.

Office Hours: Any time by appointment via Zoom. Designated office hours in *Navigate* on Mondays 10-12pm.

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Prerequisite: Biology 300 or permission of instructor

Credit hours: 3.0

Required textbook: *Principles of Neural Science*, Kandel et al., (2013), Fifth Edition, McGraw Hill.

Description: Molecular components and molecular mechanisms involved in the cell biology of neurons and glia, neuronal signaling, neuronal development, learning, memory and diseases of the nervous system.

Course Structure and Navigation Description

THIS COURSE IS 100% ONLINE SYNCHRONOUS. We will cover every objective in the Course Outline (below).

Time Management on your part will be **key** in the success you will have at the end of the course.

The content from the Course Outline has been divided into "Three Parts". Each part is subdivided into sections that can be found in the required textbook for this course. Each section

is contained in a PowerPoint lecture packet posted on Blackboard. Each section contains the relevant chapter numbers from the textbook. Additionally, review articles and research articles from the neurobiology literature will be posted on Blackboard.

Netiquette in this course

"The classroom is a space for free and open inquiry and for the critical evaluation of ideas, and it should be free of personal prejudice. Students have an obligation to all members of the class to create an educational atmosphere of mutual trust and respect in which differences of opinion can be subjected to deliberate and reasonable examination without animus. Students are expected to follow and adhere to classroom discussion guidelines."

Course Objective

The main objective of this course is to provide essential concepts of how the brain works at the molecular level. We will discuss basic mechanisms from biochemical to cellular and systems neurobiology. At the end of this course the student will be able to read a research article from the literature and be able to provide a critical analysis of the content.

Grading: There will be three online exams (Blackboard Collaborate). Exam dates are listed under "Schedule of Classes" at the end of this syllabus. I will hold review sessions before each exam. The average of these exams will be the final grade.

Extra credit and make-up exams: There will be no extra credit assignments. Opportunities to make up exams may be granted if and only if students can provide a university-sanctioned excuse supporting documentation. If you miss an exam, you will automatically earn a grade of zero for this exam and it will be used in calculating your final grade. **Make-up exams will be all-essays in BB.**

Policy on incomplete grades: Incomplete grades will be allowed only under exceptional circumstances; arrangements for completion of the required work must be made according to Hunter College policy.

GRADES: A⁺, A, A⁻, B⁺, B, B⁻, C⁺, C, D, I, F.

Plagiarism and other forms of academic dishonesty: "Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedure."

STUDENT LEARNING OUTCOMES

1. *The student will gain a deep knowledge of the molecular underpinnings of neurobiological mechanisms such as reward, memory and learning.*
2. *The mechanism of action of the various neurotransmitters will be studied in detail from receptor to signaling pathways and physiological responses.*
3. *The role of growth factors, channels, glia, structural proteins and macromolecular complexes in the development, maintenance and neurochemical mechanism serving brain physiology.*
4. *The pathways serving motor control, motivated behaviors and neurological disorders will be studied.*
5. *The student will be able to read papers in the neuroscience literature and appreciate the scientific contributions of the paper. Throughout the course attention is paid to experimental details and how they translate into knowledge of brain function.*
6. *The student will be able to appreciate the importance of the molecular mechanisms in maintaining normal neurophysiological responses and how aberrations and environmental factors can contribute to the development of disease states.*

Course Study Tools

Blackboard is the primary method of communication in this course. It is **your responsibility** to check your emails. I will convey announcements using the Blackboard group email system. Include Biol 380 (01 or 02) in all emails to me.

Textbook: well-organized and clear chapters. Required for this course.

PowerPoint Lecture packets will be posted on Blackboard.

Two review sessions prior to each exam.

At least 3 Question and Answer sessions per exam.

OUTLINE OF THE COURSE

(All sections in Parts 1-3 contain PowerPoint lecture files that will be posted in Blackboard. All lectures will be recorded in BB)

Biology 380 Molecular Neurobiology

Professor Jesus Angulo

Week-per-Week Schedule of Classes

Meeting times: Mondays and Thursdays from 1:10-2:25pm & 2:45-4pm

Required textbook: *Principles of Neural Science*, Kandel et al., (2013), Fifth Edition, McGraw Hill.

| Week:dates | Study materials in BB | Discuss | Assignments | Packets |
|-------------------|------------------------------|----------------|--------------------------|----------------|
| Week 1: 8/26 | Syllabus, The Brain | Slides 1-10 | Chapter 1 | 1.1 |
| Week 1: 8/30 | The Brain | Slides 11-30 | Chapter 2 | 1.1 |
| Week 2: 9/2 | The Brain | Slides 31-33 | Chapter 2 | 1.1 |
| | The Neuron | Slides 1-17 | Chapter 4,5 | 1.2 |
| Week 2: 9/9 | The Neuron | Slides 18-20 | Chapter 4,5 | 1.2 |
| | Neurotransmitters | Slides 1-17 | Chapter 13 | 1.3 |
| Week 3: 9/13 | Neurotransmitters | Slides 18-33 | Chapter 13 | 1.3 |
| Week 3: 9/20 | Functional Anatomy | Slides 1-28 | Chapter 15 Appendix D | 1.4 |
| Week 4: 9/23 | Neuroanatomy | Slides 1-26 | Chapter 16,17 | 1.5 |
| Week 4: 9/27 | Review 1 | | | 1.1,1.2,1.3 |
| Week 5: 9/30 | Review 2 | | | 1.4, 1.5 |
| Week 5: 10/4 | Exam 1 in BB | | | 1.1-1.5 |
| Week 6: 10/7 | Basal Ganglia | Slides 1-16 | Chapter 43 | 2.1 |
| | Degenerative Disorders | Slides 1-9 | Chapter 44 | 2.2 |
| Week 6: 10/14 | Metabotropic Receptors | Slides 1-20 | Chapter 11 | 2.3 |
| Week 7: 10/18 | Metabotropic Receptors | Slides 20-38 | Chapter 11 | 2.3 |
| Week 7: 10/21 | Axonal Guidance | Slides 1-20 | Chapter 54 | 2.4 |
| Week 8: 10/25 | Synapse Formation | Slides 1-20 | Chapter 55 | 2.5 |
| Week 8: 10/28 | Mental Disorders | Slides 1-22 | Chapter 62,63 | 2.6 |

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| Week 9: 11/1 Week9 : 11/4 | Review 1 Review 2 | | | 2.1, 2.2, 2.3 2.4, 2.5, 2.6 |
| Week 10: 11/8 Week 10:11/11 | Exam 2 in BB Synaptic Transmission | Slides 1-22 | Chapter 12 | 2.1-2.6 3.1 |
| Week 11:11/15 Week 11:11/18 | Synaptic Transmission Parkinson's Disease Parkinson's Disease | Slides 22-30 Slides 1-14 Slides 14-32 | Research Article Chapter 44 Research Articles | 3.1 3.2 3.2 |
| Week 12: 11/22 Week 12: 11/29 | Parkinson's Disease Learning & Memory | Slides 32-53 Slides 1-35 | Research Articles Chapter 66 | 3.2 3.3 |
| Week 13: 12/2 Week 13: 12/6 | Homeostasis/Addiction Review 1 | Slides 1-29 | Chapters 47,49 | 3.4 3.1,3.2 |
| Week 14: 12/9 Week 14: 12/13 | Review 2 Exam 3 | | | 3.3,3.4 3.1-3.4 |
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PPT slide packets and research articles will be posted in Blackboard under "Course Materials."