

Columbia University
Department of Biological Sciences
W3004/W4004: Cellular and Molecular Neurobiology, Section 002

Fall 2023

Lectures: M/W 1:10 -2:25

Location: 717 Hamilton Hall

Instructor:

Ishmail Abdus-Saboor, ia2458@columbia.edu

Office hours: 3:00-4:00 on Fridays, Jerome Green Science Center at Zuckerman Institute, Quad 6C

Teaching Assistants (TAs)

Biological Sciences PhD students and office hours:

1. Brittany Bistis, bb2977@columbia.edu, Mondays 6:10-7:00, Room 800 Fairchild
2. Preston Sheng, ss6573@columbia.edu, Tuesdays 7:10-8 pm, Room 800 Fairchild
3. Isabella Succi, is2687@columbia.edu, Thursdays 7:10-8 pm, Room 800 Fairchild

Textbook:

“Neuroscience”, 6th ed., 2018, Purves et al. Oxford University Press. The textbook serves as a general guide for background material to follow along with course content. Students should rely on the material covered in class for the most up-to-date information that they will be responsible for on exams, quizzes, and homework.

Coursework:

The Coursework site will contain a great deal of information pertinent to this course including the course syllabus, lecture schedule updates, PowerPoint slide sets, further readings and links to useful web-based resources. Slides will be uploaded shortly after each class. Students are encouraged to follow along and engage during the class, asking questions during the class, and jotting down notes by hand or computer. Only students registered for this course have access to the Coursework site. This site will be updated often so be sure your Coursework Notification Preferences enable you to keep up with these updates.

Addressing questions and email policy:

Questions you have are often questions that others have, so please share them with your colleagues. Participating in some of our office hours is, by far, the best way to address questions in a timely manner. Outside of office hours, procedural questions and questions about course content should be directed first to our Discussion Board on Coursework. Since this resource is monitored by the instructor and TAs, you can usually expect a response by the next weekday. If you would like further discussion, we invite you to email

your TAs directly. Emails to the instructor about course issues and personal matters are addressed regularly, but usually only twice a week (like office hours).

Office hours:

Office hours will be held each week. These multi-student sessions provide an opportunity to ask questions and to listen to other students' questions and ideas. Your attendance is optional but highly encouraged. Office hours can also be arranged by appointment (email best) with TAs and instructors. In addition, Dr. Abdus-Saboor will also be available after for ~10-15 minutes after most class meetings.

Recitations: A strong emphasis is placed on readings from the primary literature, which will be discussed in weekly recitations. Students will read and discuss in depth selected research papers. Attendance at the recitations is mandatory and active participation will count 5% towards the final grade (see below). Materials discussed in the recitations will be included in the exams. You must be enrolled in one of the recitation sections to take the course.

Class Attendance: In person attendance is required for this course and we will take attendance at each class. Attendance is worth 5% of your grade (see below). It is also important to attend class so that you are familiar with the material that you will be tested on – which sometimes may differ from what the textbook covers on a particular topic.

Exams and Grading:

There are three exams scheduled during the semester plus a cumulative Final Exam. Each exam will be worth 100 points. The course is graded on a 400-point scale such that only 3 of the 4 exams are included in the calculation of the final grade (75% of your grade). Since only three of the four exams will be included in the calculation of your final grade, **no make-up exams will be given.** The final exam is cumulative and will count as 1 of the 4 exams. Therefore, some students may elect to skip the final if they are already happy with their grades from the first 3 exams. Requests for exam re-grades will only be considered for one week after the exam is returned to you, and **all answers are subject to reconsideration at that time.** These requests must be typewritten. After an exam, a key with suggested answers will be posted on the Coursework site. 15% of your grade (60 points) will consist of 6 quizzes given throughout the semester. 5% of your grade (20 points) will consist of class attendance. Another 5% will consist of attendance and participation at recitations (20 points). You are allowed 3 unexcused absences over the course of the semester for both recitation and lectures without losing any of the 20 points allotted for each.

Lecture Schedule and reading assignments.

The reading assignments are page numbers from the text book 6th edition. If you use earlier editions you will need to determine the correct page numbers. It is strongly suggested that you do at least a cursory reading of the assigned text BEFORE the lecture as this will familiarize you with any new terms and make the lectures more comprehensible.

The course is organized into three main sections with an exam at the end of each section covering material from that section only.

Part I: Electrical Properties of Neurons

Date	Class #	Topic	Textbook pages
9/6/23	1	Introduction; The neuron and its molecular parts	Chapter 1, pp 1-13, box 1A p.17
9/11/23	2	Ionic Basis of the Resting Membrane Potential	Chapter 3, pp. 46-57
9/13/23	3	Ion Channels and Transporters Quiz #1	Chapter 4 pp. 65-83
9/18/23	4	Ionic Basis of the Action Potential	Chapter 3, pp. 46-57
9/20/23	5	Passive Electrical Properties of the Neuron & Propagation of Action Potentials	Chapter 3, pp 57-65
9/25/23	6	No class; Review session	

Part II: Synaptic Transmission

9/27/23		Exam 1	
10/2/23	7	Synaptic Transmission: Overview, Neuromuscular Junction	Chapter 5, pp. 85-112
10/4/23	8	Synaptic Transmission: Pre- and Post-synaptic mechanisms	Chapter 5, 85-112
10/9/23	9	Your Brain on Drugs: Biochemistry of Neurotransmitters Quiz #2	Chapter 6, 113-144
10/11/23	10	Synaptic Plasticity	Chapter 8, 169 - 190

10/16/23	11	Introduction: Coding of Sensory Signals Quiz #3	Chapter 9, 193-212
Part III: Sensory Physiology			
10/18/23		Exam 2	
10/23/23	12	Somatosensory and touch	Chapter 10, pp. 213-231
10/25/23	13	Pain Quiz #4	Chapter 10, pp. 213-231
10/30/23	14	Audition	Chapter 13, pp. 281-304
11/1/23	15	Phototransduction and Color Vision	Chapter 11, 234-259
11/6/23		No class: academic holiday	
11/8/23	16	Vestibular System Quiz #5	Chapter 14, pp. 303-321
11/13/23		No class: Society for Neuroscience Annual Meeting	
11/15/23		No class: Society for Neuroscience Annual Meeting	
11/20/23		Quiz #6	
11/22/23		Thanksgiving break: no class	
11/27/23	17	Olfaction and Taste: The chemical senses	Chapter 15, pp. 323- 354

Part IV: Modern approaches to studying neural circuits			
11/29/23	18	Guest lecture: Professor Erin Barnhart on Barnhard lab research	
12/4/23	19	Modern approaches to study neural circuits	
12/6/23		Exam 3	
12/11/23	21	Ignorance in Neuroscience with Professors Firestein and Abdus-Saboor; *extra credit given for attending this class	