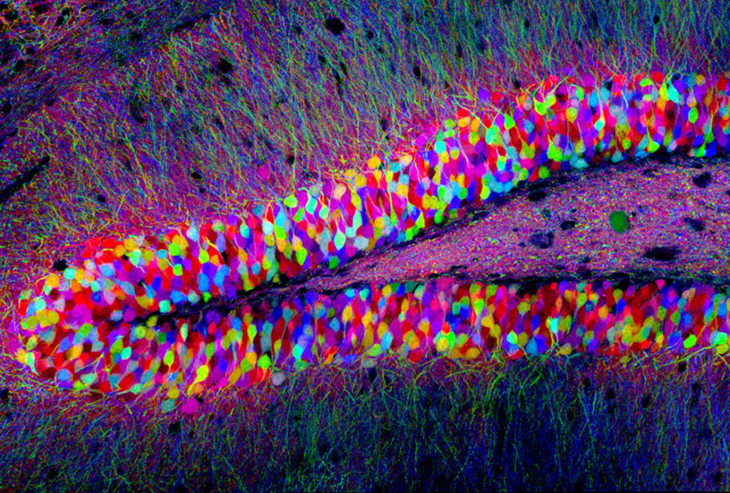
# **BISC-230 (Introduction to Neuroscience, *The Biology of the Brain*) Lecture Syllabus**

*University of Southern California (USC), Fall 2022*



***“Brainbow”*** *is a molecular/ genetic imaging method developed by a team of scientists led by Jeff W. Lichtman at Harvard University in the mid-2000’s. A genetically-modified mouse model is engineered to express a gene which codes for three different colored fluorescent markers, however, the exact color that is expressed varies from cell-to-cell based on the way in which the genes are spliced. While the practical utility of this kind of imaging method has been debated within the field of neurobiology, it sure does produce beautiful images!*

**Image Credit:** [Brainbow in the Hippocampus](https://www.cell.com/pictureshow/brainbow)

# **Summary and Purpose**

The overarching goal of this general education (GE) course is to provide undergraduate students with an introduction to and appreciation for the complexity and emergent properties of the mammalian nervous system, and in particular, the cerebral cortex. While there are no specific prerequisites for this course, general knowledge of high school-level biology, chemistry and physics is helpful. Please note that this course is not designed for students majoring in biology or related health science disciplines. Those considering or currently pursuing a major in neuroscience should consider taking BISC-421, an analogous course designed for neuroscience and related majors.

# **Learning Objectives**

By the end of the semester, students will be able to:

* ***Describe*** the general electrical and chemical signaling mechanisms that underlie the function of the entire nervous system.
* ***Summarize*** the relationship between the central and peripheral nervous systems, in terms of coordinating whole-body functions and behaviors.
* ***Identify*** key neuroanatomical structures and landmarks in the central nervous system, and their associated functions.
* ***Explain*** the ways in which genetic and environmental factors can influence underlying neurophysiology and neuropathology.

**Instructor:** Rita Barakat [“REE-duh BEAR-uh-CAT”, she/ her], PhD, [rbarakat@usc.edu](mailto:rbarakat@usc.edu)

**Office Hours:** Wednesdays, 2:30 - 4:00 pm in HNB 117, *OR* by appointment via Zoom (appointments must be made *at least 24 hours in advance*)

**Laboratory Director:** Michael Moore, PhD, [moore@usc.edu](mailto:moore@college.usc.edu), **Office:** ZHS 371B

**Graduate Student Teaching Assistant:** Daniel Hicks, [hicksd@usc.edu](mailto:hicksd@usc.edu), **Lab Sections:** Mondays from 10:00 - 11:50 am and 2:00 - 3:50 pm, and Friday from 10:00 - 11:50 am in ZHS 372, **Office Hours:** By appointment via Zoom

# **Recommended Textbooks:**

# **“MM”:** [*The Mind’s Machine: Foundations of Brain and Behavior (3rd Edition)*](https://www.amazon.com/Minds-Machine-Foundations-Brain-Behavior/dp/1605357308), by Neil V. Watson & Marc S. Breedlove. Published by Sinauer, ISBN: 978-0-878-93933-6.

* **“SP”:** [*Sensation and Perception (5th Edition)*](https://www.amazon.com/Sensation-Perception-Jeremy-M-Wolfe/dp/1605356417)*,* by Jeremy M. Wolfe et al., Published by Sinauer, ISBN: 978-1-605-35211-4.

**Assigned Readings**

All assigned readings listed on the course syllabus are recommendations, but are not required readings. Exam questions will not be based on information that is only included in the textbook, though information presented in lectures will be aligned to and overlap with information included in these assigned readings.

# **Lectures**

All lectures will be held in-person in the Mudd Hall of Philosophy (MHP), Room B7B. Lectures will also be streamed live and recorded via Zoom, and the Zoom meeting information will be made available on the course Blackboard page. Lectures take place live on Mondays, Wednesdays and Fridays from 12:00 - 12:50 pm (PT), as per the USC Fall 2022 Schedule of Classes. All lectures will be recorded and automatically made available via the course Blackboard page within 24 hours of the live lecture broadcast.

Attendance at lecture is not mandatory, however, unforeseen technical issues may result in a delay in uploading or complete loss of a lecture recording, and thus, it is in your best interest to attend the live in-person lectures whenever possible. Recurring schedule conflicts with live lectures require a formal petition from the Registrar’s Office, please contact the course instructor and lab director if you anticipate that you will have this kind of conflict with the lecture (or lab) portions of the course.

# **Laboratory**

Please make sure to review the associated *Laboratory Course Syllabus/ Manual* to ensure that you have all the necessary information and materials for the lab portion of the course. Attendance in the lab section of the course is mandatory, and failure to attend lab sections will result in a significant loss of lab section points. Any foreseeable conflict(s) with lab sections should be indicated to the course lab director and the teaching assistant for that section in writing as soon as possible to avoid loss of lab section points.

# **Exams**

Content: The four exams will be based on content presented in the lecture portion of the course. While the exams are not strictly “cumulative”, the nature of the course content is such that understanding of foundational concepts presented early in the course will be necessary for understanding future topics. Thus, it is recommended that you review select topics from previous sections of the course prior to each exam, and these specific topics will be mentioned in lecture and exam review sessions leading up to each exam.

Dates: Exams will take place in-person in the regular lecture hall (MHP B7B), unless otherwise noted. Students with OSAS-approved accommodations will be notified in advance of any alternative locations. Please mark the following dates and times for the four lecture exams in your calendar.

**Lecture Exam 1: Friday, 9/16 from 12:00 - 12:50 pm (PT)**

**Lecture Exam 2: Wednesday, 10/12 from 12:00 - 12:50 pm (PT)**

**Lecture Exam 3: Monday, 11/7 from 12:00 - 12:50 pm (PT)**

**Lecture Exam 4: Friday, 12/9, from 11:00 am - 1:00 pm (PT)**

See the *Absences, Extensions and Make-ups* and *Technology* sections below for more information on the administration of lecture exams. All exam-related accommodations must be documented through OSAS prior to the administration of the exam.

Regrade Policy: Exam regrade requests will only be accepted if they are submitted in writing within 24 hours of receiving your exam grade and include the information in the *Exam Regrade Request Form*, which can be found on the course Blackboard page.

# **Grading**

Your overall course grade will be broken down into the following categories/ point values, for a total of *500 points*. There are no extra credit opportunities in this course, so please do not ask about them.

| **Deliverable** | **Points** |
| --- | --- |
| Lecture Exam 1 (*Friday, 9/16*) | 100 |
| Lecture Exam 2 (*Wednesday, 10/12*) | 100 |
| Lecture Exam 3 (*Monday, 11/7*) | 100 |
| Lecture Exam 4 (*Friday, 12/9*) | 100 |
| Laboratory | 100 |
| **TOTAL** | **500** |

It is not our intention to curve course grades, however, there historically have been independent curves for each exam. Please note that any curves are not indicative of the final course grades, as these curves will vary based on overall course performance on individual exams and in lab sections.

# **Communication**

If you ever need to communicate with the course instructor outside of class, please visit during scheduled office hours, or you can send an email with **your name and “BISC-230” in the subject line** to [rbarakat@usc.edu](mailto:rbarakat@usc.edu) to make an appointment for office hours or share written inquiries. All emails sent after 6:30 pm (PT) may not receive a response until the following day. In general, all emails sent during a weekday (Monday - Friday) will receive a response within 24 hours, and all emails sent during a weekend (Saturday - Sunday) will receive a response within 48 hours, with some exceptions for holidays. It is strongly recommended that you check in with the course instructor and/ or lab director at least once throughout the semester in office hours, and we recommend that you set up an appointment at least 24 hours in advance to best accommodate your schedule. Questions about lecture content should be first directed to the teaching assistant, and if they are unable to answer your question and/ or if you would like further clarification, you may contact the course instructor and/ or lab director. All questions about grading should be directed to the lab director for the course. The teaching assistant will not respond to any grading-related inquiries.

# **Absences, Extensions and Make-ups**

There are absolutely no extensions, make-up exams or make-up lab assignments in this course, except in the case of certain extenuating circumstances (such as a documented medical condition or family emergency). If you miss one exam in the course, your exam grade will be an average of your other three exam scores. If you miss two or more exams, you will receive an Incomplete ( I ) grade for the course.

As we will be conducting the course predominantly in-person, it is important that you follow the guidelines below as it relates to your physical health and well-being. Despite the lack of restrictive public health policies and requirements in-place, COVID-19 and other infectious diseases are still prevalent in the community, so in order to protect yourself and your classmates, please make sure to do the following:

* If you feel sick, notify the lab director and teaching assistant via email *immediately* and *do not attend the lecture or laboratory sections in-person*.
* Explain your *valid reason* for being absent (physical/ mental health-related or family emergency).
* Provide information about how you intend to *stay on top of the information* presented in the section(s) you missed (i.e. scheduling a visit for office hours with the instructor, lab director and/ or teaching assistant).

# **Technology**

A computer with stable internet access, a functioning microphone, a webcam, and the latest version of [Zoom](https://zoom.us/download) installedare strongly recommended for full participation in this course**.** Please take the necessary steps before each class to ensure that all these technological requirements are met. If you have any questions, comments or concerns regarding these technological requirements, please contact the course instructor, lab director and if necessary, [Information Technology Services](https://itservices.usc.edu/contact/)(ITS, [consult@usc.edu](mailto:consult@usc.edu))as soon as possible so that we can help to accommodate your needs.

# **Diversity, Equity and Inclusion**

The BISC-230 faculty and teaching assistants take issues regarding diversity, equity and inclusion very seriously when it comes to curricula, student engagement and beyond. As a result, we expect you to be kind, courteous, patient and open-minded at all times during your participation in this course, and to be empathetic towards your peers and instructors, as their lived experiences and beliefs may differ from yours but are equally important and valid. If you or a colleague in the course is concerned about any harassment, discrimination or any other troubling behavior, please notify the course instructor and/ or lab director immediately. In addition, the [Student Health Center](https://studenthealth.usc.edu/), the [Ombuds Office](https://ombuds.usc.edu/) and [Title IX Office](https://eeotix.usc.edu/) are all resources available to you to address issues related to harassment and discrimation of any kind.

# **Special Accommodations**

If you require any special accommodations (including, but not limited to: closed captions during discussion sections via Zoom/ Google Slides, additional time to complete written exercises and quizzes, alternative assignments due to a physical or mental/ psychological condition, etc.), please let the course instructor and lab manager know so we can do our best to accommodate your needs. In addition, please ensure that you are registered with the [Office of Student Accessibility Services (OSAS)](https://osas.usc.edu/) so that your accommodations are met in a timely manner.

**Academic Integrity**

There is a zero-tolerance policy for any cheating or plagiarism of any kind in this course. Those who are caught engaging in this breach of academic conduct will automatically receive a zero grade for the assignment in question, and potentially other consequences as dictated by [USC Code of Ethics](https://policy.usc.edu/code-of-ethics/).

# **Lecture Calendar** (*this calendar is subject to change*)

| **Week** | **Lecture** | **Date** | **Topic(s)** | **Optional (Textbook) Reading** |
| --- | --- | --- | --- | --- |
| **1** | **1** | *Monday, 8/22* | Course Overview and History of the Field |  |
| **2** | *Wednesday, 8/24* | Evolution of the Brain | **MM:** Chapter 1 |
| **3** | *Friday, 8/26* | Neuroanatomy | **MM:** Chapter 2  **SP:** Chapter 1 |
| **2** | **4** | *Monday, 8/29* | Cells of the Nervous System | **MM:** Chapters 2 and 13  **SP:** Chapter 1 |
| **5** | *Wednesday, 8/31* | Development of the Nervous System |
| **6** | *Friday, 9/2* | Electrical Properties of Neurons | **MM:** Chapter 3  **SP:** Chapter 1 |
| **3** | **7** | *Monday, 9/5* | **Labor Day (No Lecture)** |  |
| **8** | *Wednesday, 9/7* | The Action Potential and Myelination | **MM:** Chapter 3  **SP:** Chapter 1 |
| **9** | *Friday, 9/9* | Synaptic Plasticity |
| **4** | **10** | *Monday, 9/12* | Methods in Neuroscience |  |
| **11** | *Wednesday, 9/14* | **Lecture Exam 1 Review** |
| **12** | *Friday, 9/16* | **Lecture Exam 1 (MM: Chapters 1-3 and 13, SP: Chapter 1)** | |
| **5** | **13** | *Monday, 9/19* | Motor Systems and Posture | **TBD** |
| **14** | *Wednesday, 9/21* |
| **15** | *Friday, 9/23* | Somatosensation and Pain Perception | **MM:** Chapter 5  **SP:** Chapter 13 |
| **6** | **16** | *Monday, 9/26* | Auditory System | **MM:** Chapter 5  **SP:** Chapters 9-10 |
| **17** | *Wednesday, 9/28* |
| **18** | *Friday, 9/30* | Vestibular System | **MM:** Chapter 5  **SP:** Chapter 12 |
| **7** | **19** | *Monday, 10/3* |
| **20** | *Wednesday, 10/5* | Olfactory System | **MM:** Chapter 5  **SP:** Chapter 14 |
| **21** | *Friday, 10/7* | Gustatory System | **MM:** Chapter 5  **SP:** Chapter 15 |
| **8** | **22** | *Monday, 10/10* | **Lecture Exam 2 Review** |  |
| **23** | *Wednesday, 10/12* | **Lecture Exam 2 (MM: Chapters 4-5, SP: Chapters 9-10, 12-15)** | |
| **24** | *Friday, 10/14* | **USC Fall Recess (No Lecture)** |  |
| **9** | **25** | *Monday, 10/17* | Optics and Anatomy of the Eye | **MM:** Chapter 7  **SP:** Chapter 5 |
| **26** | *Wednesday, 10/19* | The Visual System | **MM:** Chapter 7  **SP:** Chapter 5 |
| **27** | *Friday, 10/21* |
| **10** | **28** | *Monday, 10/24* |
| **29** | *Wednesday, 10/26* | Object Recognition and Perception | **MM**: Chapter 4 |
| **30** | *Friday, 10/28* | Motion Perception and Binocular Vision | **MM:** Chapter 6  **SP:** Chapter 6 |
| **11** | **31** | *Monday, 10/31* | Computer Vision and Artificial Intelligence |
| **32** | *Wednesday, 11/2* | Attention | **MM:** Chapter 14  **SP:** Chapter 7 |
| **33** | *Friday, 11/4* | **Lecture Exam 3 Review** |  |
| **12** | **34** | *Monday, 11/7* | **Lecture Exam 3 (MM: Chapters 4, 6-7 and 14, SP: Chapters 5 - 7)** | |
| **35** | *Wednesday, 11/9* | Learning and Memory | **MM:** Chapter 13 |
| **36** | *Friday, 11/11* |
| **13** | **37** | *Monday, 11/14* | Circadian Rhythms and Sleep | **MM:** Chapter 10 |
| **38** | *Wednesday, 11/16* |
| **39** | *Friday, 11/18* | Language | **MM:** Chapters 8 and 12 |
| **14** | **40** | *Monday, 11/21* |
| **41** | *Wednesday, 11/23* | **Thanksgiving Holiday (No Lecture)** |  |
| **42** | *Friday, 11/25* |
| **15** | **43** | *Monday, 11/28* | Emotion | **MM:** Chapter 14 |
| **44** | *Wednesday, 11/30* | Hemispheric Specialization and Lateralization | **MM:** Chapter 15 |
| **45** | *Friday, 12/2* | **Lecture Exam 4 Review** |  |
| **16** | **46** | *Friday, 12/9* | **Lecture Exam 4 (MM: Chapters 8, 10, 12-15)** | |