BIOLOGY of NEURONAL CIRCUITS for BEHAVIOR

Fall 2024

BIOL-L 410 *Topical Issues in Biology*

Section 32253

Instructor: Maria de la Paz Fernandez <fernanm@iu.edu> (Currently: mfernand@barnard.edu)

Tuesdays and Thursdays 11:30AM – 12:45PM

Classroom: JH A105 (Biology Building, Room A105)

Please read the syllabus carefully. By enrolling in this course, you are agreeing with the class policies, exam schedules, grading criteria, and all other details outlined in this syllabus.

1- COURSE DESCRIPTION: This course introduces students to the study of neuronal circuits that control behavior. The focus will be on the neuronal network that controls of circadian timekeeping, a well-characterized brain structure that controls sleep/wake cycles among other rhythms in physiology and behavior across species. We will discuss the neuronal basis for jet-lag, synchronization to light and temperature cues in the environment, and clock control of sex-specific behaviors, among other topics. Students will learn about genetic tools for neuronal circuit mapping and connectomics analysis, and will present and discuss primary literature on chronobiology and behavioral neuroscience.

2- LEARNING GOALS (OUTCOMES)

At the end of the course, students should be able to:

1) Understand current methods for manipulations of neuronal activity in mammals and *Drosophila* and the implications for behavior, with a focus on circadian rhythms.

2) Explain fundamental principles of neuronal connectivity.

2) Use publicly available connectomics datasets to study neuronal connectivity patterns.

4) Read and interpret primary research articles on behavioral neurobiology and critically assess their conclusions.

5) Propose alternative hypotheses to those presented in the articles discussed in class and design experiments to test those hypotheses.

6) Write a research proposal based on topics and experiments discussed in class.

3- GRADING:

Participation in class (10 points): Active participation in class is expected. All students will be expected to participate in discussions of concepts presented in lectures, primary literature, and paper presentations.

Quizzes (20 points, the best 4 scores out of 5 quizzes will be incorporated into the grade): They are intended to emphasize the importance to coming to class having read the material. You can have the articles and your notes with you during the quizzes, which may involve concepts from previous classes. If you missed a class, you are still expected to read and be able to discuss the article that was discussed during that class, and questions about its content may be included in subsequent quizzes. There will be no make-up quizzes. Quizzes will be taken in person in class and will be based on material discussed in class, as well as material that comes from the readings and/or lectures.

Neuronal connectivity report (30 points): Students will be required to write a report of the connectomics analysis performed with their assigned neuronal subpopulations. This will include top pre and post synaptic partners, connections to other clock neurons, and shortest paths between the assigned cluster and a sex-specific cluster.

Presentation (20 points): Students will present their assigned paper and discuss the background, figures, and conclusions during class. A presentation may consist of two short articles that are closely related or in one longer article with several figures. The presenting students will be expected to provide a mini lecture of the most salient information, identifying the distinctive elements of a scientific paper. These presentations will evaluate students' proficiency in interpreting scientific data and communicating scientific concepts. Students who are not presenting will be expected to come to class having read the articles and actively participate in discussions.

Research Proposal (20 points). At the end of the term, students will be required to prepare a short research proposal based on one of the topics discussed throughout the course. These assays should include a simple hypothesis and at least one experiment to test it. The proposal should include a minimum of 10 references cited in accordance with the APA style guidelines.

Additional details about each of the grading categories as well as grading rubrics can be found in the "Grading" section on Canvas.

Grading and Grade Scale: The grading scale is as follows:

A+	100-99.5
A	99.4-96
A-	95.9-90
B+	89.9-88
B	87.9-82
B-	81.9-80
C+	79.9-78
C	77.9-72
C-	71.9-70
D	69.9-60

F 59.9-0

4- CLASS POLICIES

Readings: No text is required, and all assigned readings will be available through Canvas.

Class Format: The course will be focused on a combination of lectures, connectomics analysis, paper presentations, and group discussions and it is designed to be interactive and informal. All required readings will be posted on the course home page in a folder corresponding to the date of each class. For each class, a group of two students will present the articles and lead the discussion. Everyone is expected to come to class having read the articles, participate in class and contribute to the discussions. Participation in class is an important component of the grade.

Academic Integrity: As a student at IU, you are expected to comply with the standards and regulations outlined in the Code of Student Rights, Responsibilities, and Conduct (http://studentcode.iu.edu/). By submitting an assignment under your name, you are affirming that the work is your own unless appropriately cited or referenced. Any use of ideas or materials from external sources, whether for written or oral presentations must be acknowledged. Any suspected breaches of the Code will be addressed according to university protocols. Consequences for academic misconduct may range from a failing grade on the assignment to a reduction in your final course grade or even failing the course. In class, we will provide students with guidelines about how to incorporate citations into scientific writing. Please read and follow them carefully. If you have any questions about the correct use of materials that are not your own (e.g., images, data, ideas, theories, etc.), please contact the instructor.

Attendance: As participation in courses is an important component of the grade, it is assumed that students will make every effort to attend all classes. If medical or other emergencies keep a student from attending class, an email (fernanm@iu.edu) is required before class starts to explain the absence.

5- TENTATIVE SCHEDULE (TBD)