

Bi410/510 – Neurogenetics

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Tentative Syllabus - will be updated dependent on student choices of papers

The overarching goal of this course will be in examining the relationship between genes and behavior. Students will learn both classic and contemporary genetic tools that are utilized by researchers to study behaviors such as courtship, addiction, memory, sleep and aggressive behavior. The course will focus on animal model systems amenable to genetic manipulation and will explore concepts broadly. The course will extensively discuss the relationship among genetics, development, and neural circuitry. The course is based on primary research literature and will emphasize critical reading of the literature and critical thinking. Students will be required to present papers from the literature and to complete regular homework assignments. During the course, students will develop original research proposals that will use the types of experimental approaches covered in the course to address unanswered questions about Neurogenetics. Students will present these proposals orally and submit them as a final written research project.

Learning objectives for all students:

- Gain an understanding of mechanisms underlying the linkage between genes and behavior, including similarities and differences amongst different animal taxa;
- Explore how alterations in aspects of genetics and the behavioral can result in human neurodevelopmental disorders and the importance of animal research for elucidating underlying mechanisms;
- Become proficient at reading, discussing, and presenting primary research literature and critically evaluating data;
- Develop the ability to formulate hypotheses about the mechanistic bases for biological phenomena;
- Become proficient at designing experimental strategies to test hypotheses about the mechanistic bases for biological phenomena;
- Learn to give an oral presentation and to discuss primary research literature critically;
- Learn to give a concise and compelling oral presentation that identifies a scientific question, proposes a hypothetical answer to this question, and describes a novel experimental strategy to test this hypothesis;
- Learn to write a concise and compelling research proposal that identifies a scientific question, proposes a hypothetical answer to this question, and describes a novel experimental strategy to test this hypothesis.

Course format: The course will be a combination of lectures, class exercises, discussions, and student presentations. Figures for presentations will be posted on Canvas before class. These figures are not a substitute for attending to class. This class is built around the concept of colleagues working together to better understand science and the scientific process. You must attend lectures and take part in the discussions.

Readings: Assigned readings for each class session are available in the Modules for that lecture. Pdf files for all assigned readings are posted on Canvas. In some cases, pdf files of papers that provide background or additional information are also posted on Canvas.

The syllabus is “tentative” because papers pertinent to the course will be chosen during the term, therefore we will adapt as we go through the term. Updates will be made available ASAP in Canvas.

Grading Policy: – all work must be your own original work. Anything less will result in a Fail.

Homework (15%): There will be homework assignments that will cover assigned readings and material covered in class. These will either be quizzes available on Canvas or will be a standard response to a paper that you will upload to Canvas. These tasks will ask you to read and analyze the paper of interest for that day. Each homework is due before class – you must enter your responses in Canvas before the lecture begins. Late homework will not be accepted. You must do your own work, no exceptions.

Class Participation (20%): Class participation is crucial for the success of this course. This portion of the grade will be made up of assignments (critiques of presentations and feedback on proposals) as well as attendance and in class participation. Attendance will be taken and students will be expected to come to class having reading and thought about the assigned material and prepared to participate in all class activities. As you read the assigned articles, please keep in mind that some of the topics we will cover are controversial and one should never take data in a paper simply at face value. Therefore, you should think critically about what you are reading, continually question how the authors of an article arrived at their conclusions, what assumptions they made, whether the data seem credible, and what future experiments could support or refute the conclusions. This type of critical thinking will be necessary for your original research proposal.

Group presentation Background/Techniques (10%): Each student will work in a small group (typically 2-5 students, dependent on class size) to lead a discussion of the background of a research article and the techniques used. The articles that will be

discussed will be posted on Canvas. The paper will be determined by the group in collaboration with the instructor.

Group presentation Paper breakdown (15%): Each student will work in a small group (typically 2-5 students, dependent on class size) to present the logic and goals of a research article to the class. The articles that will be discussed in the student presentations will be posted on Canvas. *The paper will be determined by the group in collaboration with the instructor.*

Proposal assignments, presentation, and written proposal (40% total): Each student will be required to write and to present an original research proposal that uses approaches similar to those covered in the course to address an unanswered question in the field of neurogenetics. Students will develop their proposals throughout the course, as indicated on the class schedule.

The components of this proposal development process will contribute to the final course grade as follows:

- (1) Title, abstract, aims; (2) REVISED title, abstract, aims; (3) outlined experimental design & expected outcomes: **15%**
- Oral presentation: **10%**
- Written research proposal: **15%**