BIOL 383: Neural Basis of Behavior

Tues/Thurs 8:30-9:50am, Central King Building 320

SYLLABUS DRAFT 9/1/25 – SUBJECT TO REVISION

Instructor: Dr. Julia Hyland Bruno
Contact: julia.hylandbruno@njit.edu
Office hour: Tues 3-4pm or by appointment, on Zoom

PREREQUISITES

Foundations of Biology lecture and lab courses with a grade of C or better: both Cell and Molecular – BIOL 201 and BIOL 202 (or R120 201 and R120 202) – and Ecology and Evolution – BIOL 205 and BIOL 206 (or R120 205 and R120 206).

COURSE DESCRIPTION

How does the brain control behavior? To answer this rather broad question, we will explore how scientists study and understand behavior and, in turn, develop hypotheses, predictions, and experiments that reveal the neural mechanisms for specific behaviors. We will review and discuss several "model animal systems" in which scientists have remarkably succeeded in understanding the interplay between neural mechanisms and behavior.

LEARNING OUTCOMES

This course provides the opportunity for students to:

- participate in a curiosity-based exploration of the relationships between neural mechanisms and behavior;
- gain familiarity with prominent theoretical perspectives, model systems, and empirical findings in the history of neuroethology and related fields;
- develop experimental logic skills by scrutinizing classical and contemporary neuroethological studies as well as through hands-on learning experiences;
- learn how to identify, ask, and attempt to answer mechanistic, developmental, functional, and evolutionary questions about animal behavior;
- take an active role in their own learning.

COURSE MATERIALS

Course notebook: **This is a device-free course during class meetings: use of phones, tablets and laptops is neither needed nor permitted.** Please obtain a course notebook and bring it with you to every class. If writing by hand is an issue for you, please speak with me individually.

Readings: Readings are optional and recommended to clarify or add to the discussion in class. Most readings will be chapters drawn from the following texts:

- Zupanc, G. K. H. (2010/2019 [2nd/3rd Ed.]). *Behavioral neurobiology: An integrative approach.* Oxford University Press.
- Sillar, K. T., Picton, L. D., & Heitler, W.J. (2016). *The neuroethology of predation and escape*. John Wiley & Sons.
- Kirby, E. D., Glenn, M. J., Sandstrom, N. J., & Williams, C. L (Eds.). (2024). *Introduction to behavioral neuroscience.* OpenStax. https://openstax.org/details/books/introduction-behavioral-neuroscience

Course website: You will need internet access to view course content and submit assignments via the web-based course software Canvas. Please make sure that you can log in and access the site (https://njit.instructure.com/). Please always check Canvas for the most up-to-date version of the syllabus (this document) and details about assignments and grading.

Communication: Email is the primary mode of communication in this course. Please check your email regularly and make sure your Canvas notifications are set to receive broadcast announcements via email. If I do not respond to your email within 24 hours, please follow up with me.

COURSE STRUCTURE AND REQUIREMENTS

Format: This is a lecture-based course that emphasizes interactive learning through in-class discussion and reflective writing as well as an ongoing 'lab' component that involves playing a neuroethology simulation game (Crescent Loom). Assessments include individual and group assignments, two in-class written exams, and a final oral exam. *Attendance and participation are required*; *in-class work cannot be made up.*

Grading currency: **All points earned in this course are cumulative, percentage points of the final grade.** Other than losing the opportunity to earn points, there is no penalty associated with not completing a given assignment (for instance, electing not to take the final exam if it wouldn't improve your letter grade).

Graded in-class work (quizzes): Throughout the course there will be regular low-stakes quizzes i.e. in-class assignments. You can expect a quiz at the start of class roughly once per week. Each quiz is worth 1 percentage point and together the quizzes make up 5 percent of your course grade.

Ungraded in-class work (minute papers): Most class sessions will also involve ungraded (but required; see Participation, below) written work, for the dual purpose of helping you consolidate your learning of the material and giving me regular feedback about how the course is going.

Participation: Participation will be graded progressively, with grades based on submitting complete responses to feedback/reflection prompts (minute papers) as well as participating orally in class.

Office hours: I will provide a weekly sign-up sheet for my office hours. I encourage you to schedule a one-on-one meeting with me **at least** once during the first half of the course.

Exams: There will be two in-class written exams each worth 25 percentage points of your course grade and designed to assess the course learning outcomes. The final exam will be a comprehensive oral exam worth 15% of your course grade.

Crescent Loom: Throughout the semester we will be playing Crescent Loom to discover how patterns of neurons propel bodies through the world. Your portfolio of work completing Crescent Loom exercises will contribute 15% toward your course grade.

Extra credit: Most graded assignments will include the opportunity to earn some extra credit points. No additional extra credit will be offered.

Course activities are worth the following percentages of your final grade:

- **Ungraded in-class work (participation): 15%**
  - minute papers: 0.5% each
  - oral participation: 0.5% per week
- **Graded in-class work: 5%**
  - ~weekly quizzes: 1% each
- **Crescent Loom exercises: 15%**
- **Exams: 65%**
  - Exam #1: 25%
  - Exam #2: 25%
  - Final exam (oral): 15%

Letter grades will be determined using the following scale:

Percentage	Letter (description)
[90, ∞)	A (superior)
[85 , 90)	B+ (excellent)
[80, 85)	B (very good)
[75 , 80)	C+ (good)
[70, 75)	C (acceptable)
[60, 70)	D (minimum)
[0, 60)	F (inadequate)

ACADEMIC INTEGRITY AND COURSE POLICIES

Plagiarism and cheating: NJIT requires me to include this language:

> ***Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.***
>
> *Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office.* ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.*

Generative AI: Except where explicitly instructed otherwise, this course expects students to work without artificial intelligence assistance.

Class recording: **This course may not be recorded without permission of the instructor.**

Student absences for religious observance: NJIT is committed to supporting students observing religious holidays. Please notify me in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Extenuating circumstances: Any extenuating circumstances that could interfere with your ability to complete the requirements for this course must be taken to the Office of the Dean of Students. The Office of the Dean of Students will discuss your situation with you, assess any relevant documentation, and make the determination of whether extenuating circumstances exist. Special accommodations (e.g., late withdrawal from the course, request for a make-up exam, request for an Incomplete, etc.) will be granted at the discretion of the instructor.

ACCESSIBILITY AND COUNSELING SERVICES

If you anticipate any issues related to the format or materials of this course, or if you would like to discuss any accommodations that might be helpful, please contact me at the start of the semester. If you have a documented disability, or if you think you might have a disability, you should also be in touch with the Office of Accessibility Resources and Services (OARS), either to request an official accommodation or to discuss requesting one. More information about OARS is available here: https://www.njit.edu/accessibility/.

The Center for Counseling and Psychological Services (C-CAPS) provides a number of confidential resources for any student interested in seeking help with personal issues, emotional concerns, or stress. Visit https://www.njit.edu/counseling/ to learn more.

SCHEDULE

DATES	TOPIC	READING	NOTES
9/2	Introduction		
9/4	Scientific method		
9/9, 9/11	Review of neurophysiology	Z: Ch. 2 K: Ch. 1, 2	
9/16, 9/18	Motor control	Dickinson et al., 2000 K: Ch. 10	
9/23, 9/25	Sensory modalities	Z: Ch. 5 S: Ch. 1, 4, 5	
9/30, 10/7	Startle and escape response	Z: Ch. 6 S: Ch. 7, 8	10/2: NO CLASS [Wellness Day]
10/9, 10/14	Sensory processing	Z: Ch. 7 S: Ch. 3, 1.4	
10/16	Review – Exam #1		
10/21	**Exam #1**		
10/23	Sensorimotor integration	Z: Ch. 8 S: Ch. 6	
10/28, 10/30, 11/4	Communication	Z: Ch. 12	
11/6, 11/11, 11/13	Navigation and migration	Z: Ch. 11	11/13: *Animal Behaviour Live*
11/18	Neuromodulation and hormones	Z: Ch. 9	
11/20, 11/25	Learning and memory	Z: Ch. 13	11/25: NO OFFICE HR [Thurs. schedule]
12/2	Development	K: Ch. 5	11/27: NO CLASS [Thanksgiving]
12/4	Review – Exam #2		
12/9	**Exam #2**		
12/11	Integration		
TBD	**Final exam**		