Psychology 615: Systems & Behavioral Neuroscience

Course Information:

Term: Spring 2025
Section: 003
CRN: 29848

Time #1: T, 12:30-2:20pm, BRNG 1222
Time #2: F, 12:30-2:20pm, SCHM 227

Instructional Modality: In-person
Credit hours: 4.0

Instructor Information:

Professor: Dan Foti, Ph.D.
Email: foti@purdue.edu

Office Location: PSYC 1142
Office Hours: By appointment

My Outlook calendar is up to date for scheduling purposes, so feel free to choose an available time and send me a calendar invitation whenever you would like to meet. If you would prefer to meet virtually, please include the relevant link in your calendar invitation. Please make all meeting requests at least 2 business days in advance whenever possible.

You are welcome to ask questions before or after class. Outside of designated class and office hours, email is the preferred means of contact. Emails are generally read during business hours (i.e., 8am-5pm), and you should expect a reply within one business day. Please email us from your Purdue email account so that I can confirm it is you. Please also use proper email etiquette. For example, please include "PSY 615" in the subject line, address me by name, and sign the email with your name.

Course Description:

This course will provide you with a broad introduction to the field of neuroscience and how it can inform our understanding of behavior. We will cover core topics such as neuroanatomy, synaptic communication, and plasticity. We will also review neuroscience research on a range of major topics relevant to behavior: emotion, motivation, attention, learning, decision-making, and social cognition. This course will also provide a brief introduction to a variety of neuroscience research methods that are commonly used in animal and human research (e.g., electroencephalography, magnetic resonance imaging), including tutorials and live demonstrations.

Learning Resources, Technology, and Texts:

There is no required textbook for this course. There will be several assigned readings per week, which will be posted on Brightspace. These readings have been selected to provide (1) foundational information regarding major theoretical models, (2) exposure to relevant research methods, and (3) up-to-date information about the current state of knowledge within the field (i.e., empirical evidence). Please make the time to read each before the class for which they are assigned. While many of the articles are review papers, there are also several reports of original research. These are intended to illustrate some of the innovative approaches and methods in current neuroscience research. Some of the readings will be difficult for those without a background in the relevant area or methodology, so please do not be discouraged if you struggle with them. Focus on the main research questions, findings, and implications, and don't worry if you can't fully grasp the more technical details.

Class documents and announcements will be posted on Brightspace: https://purdue.brightspace.com/d2l/login

Learning Outcomes:

By the end of the course, you will:

- Understand the general neural architecture of core systems relevant to behavior
- Understand behavioral outcomes for each major neural system
- Understand how brain structure and functioning are studied in animal research
- Understand how brain structure and functioning are studied in human research
- Understand how brain functioning undergirds cognition, affect, and social processes
- Understand translation of basic neuroscience to clinical and other applied research

Assignments:

1. **Participation (10%):** Active participation in all class discussions is required. Each week, you are also expected to submit via email three (3) questions that you have about the readings and that you would like to discuss in class. Questions must be submitted through the Assignment portal on Brightspace by **12pm each Friday**.

a. Your questions should demonstrate comprehension and critical analysis of the assigned readings. They should be conceptual in nature (e.g., identifying an implication of the research findings, a methodological shortcoming, or inconsistency with other published research). Your questions need only be long enough to convey your line of reasoning (i.e., 1-2 sentences each).
b. For planned absences (e.g., University-sponsored activities, religious observances, conference travel), participation credit may be earned by attending office hours and submitting a 2-page response paper. This must be confirmed with Dr. Foti in advance for each planned absence.

2. **Live demonstrations (2 x 5%; 10% total):** We will offer several live demonstrations of neuroscience methods over the course of the semester. For two demonstrations of your choice, you are expected to submit a brief (i.e., 1-page) written summary of your observations. Each submitted summary will count 5% toward your overall course grade. If written summaries for more than two demonstrations are submitted, the highest scores will be kept.

3. **Research proposal (5% for oral presentation, 25% for written proposal; 30% total):** You will complete a research proposal that demonstrates your understanding of how neuroscience research can inform our understanding of behavior. While the specific topic is up to you, it must incorporate a neuroscience research method discussed in class (e.g., electrophysiology, functional neuroimaging). While the proposed research may also integrate multiple research methods, a proposal that focuses solely on molecular or cellular methods would not be appropriate. Ideally, this could serve as the basis for a First-Year Project, Master's Thesis, or grant proposal. Your document must be original work (i.e., not a manuscript that you have already written).
    a. Prior to submission, all topics must be approved by Dr. Foti (i.e., papers on unapproved topics will not be accepted). To receive approval, an outline of your paper is due on **3/28**. The outline will not be formally graded, but will instead serve as an opportunity to receive feedback on the choice and scope of your topic, or to help choose between multiple potential topics.
    b. You will briefly present your paper to the group during the final week of class (**4/29, 5/2**). Your presentation should be approximately 7 minutes, and visual aids are encouraged (e.g., PowerPoint).
    c. The final written paper is due via Brightspace by the end of finals week (i.e., no later than **11:59pm on Saturday, 5/10)**. The paper should be long enough to thoroughly cover the extant literature on the chosen topic and the methodology of your proposed study, most likely 10-15 pages total. Use APA style throughout. Written papers will be graded based on your ability to synthesize the extant literature, identify gaps in our current knowledge, and clearly describe your research design.

4. **Final Exam (50%):** There will be one take-home, essay-based exam covering material from the lectures and assigned readings. The exam will be posted after the final class meeting on 5/2, and completed exams will be due by the end of finals week (i.e., no later than **11:59 pm on Saturday, 5/10**).

Grading Scale:

Assignment of Letter Grades					
A	90-100%	C	70-79.99%	F	59.99% or less
B	80-89.99%	D	60-69.99%		

Late assignments will be penalized *20% for each calendar day late* (i.e., the first day late begins the minute the Assignment portal closes on Brightspace). Make-up exams will be given only for extreme and unanticipated situations, at my discretion. Extensions on class assignments may be granted for planned absences (e.g., University-sponsored activities, religious observances), if negotiated with me in advance. In such cases, you should inform me as far in advance as possible to make alternative arrangements.

If you disagree with your grade on any exam or assignment, you may request a regrade. In these cases, I will regrade the entire exam/assignment, and your overall score may either go up or down. Regraded scores will be final.

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty (e.g., plagiarism or behavior consistent with cheating) will be reported to the Office of the Dean of Students. The first instance will result in a grade of zero on that exam/assignment, and the second instance will result in an F for the course.

Attendance Policy:

Attendance is expected at all class meetings. For planned absences (e.g., University-sponsored activities, religious observances, conference travel), participation credit may be earned by attending office hours and submitting a 2-page response paper. Please make arrangements with me in advance.

Lectures and class discussions will be most valuable if you do the required reading ***beforehand***. The lectures should serve to crystallize your knowledge of the reading and provide you with an opportunity to ask questions and get clarification on more difficult issues.

You are protected by the Excused Absences Policies for a range of life events. This includes the Grief Absence Policy, Military Absence policy, Jury Duty Policy, Parenting Leave Policy, and Medical Excused Absence Policy. These policies are facilitated by the Office of the Dean of Students. In each case, you are excused from class and will be given the opportunity to earn equivalent credit for any missed assignments or exams. You may read more about these policies here: https://www.purdue.edu/advocacy/students/absence-policies.html

For unexcused absences from class, it is your responsibility to make up the material that was covered by completing the assigned readings, reviewing any materials posted on Brightspace, and getting lectures notes from a classmate. I will not share my personal notes. You are encouraged to attend office hours to have specific questions answered about the material, but I will not re-teach any lectures that you missed.

Academic Guidance in the Event of Quarantine/Isolation:

If you must miss class at any point in time during the semester due to illness, please reach out to me via Purdue email so that we can communicate about how you can maintain your academic progress. If you find yourself too sick to progress in the course, notify me via email or Brightspace. We will make arrangements based on your particular situation.

Classroom Guidance Regarding Protect Purdue:

Any student who has substantial reason to believe that another person is threatening the safety of others by not complying with Protect Purdue protocols is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights and the Violent Behavior Policy under University Resources in Brightspace.

Academic Integrity:

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace under University Policies.

Always assume the materials presented by the instructor are protected by copyright unless the instructor has stated otherwise. You are permitted to take notes, which may be used for individual/group study and for other non-commercial purposes reasonably arising from enrollment in the course. Notes taken in class, however, are generally considered to be "derivative works" of the instructor's materials, and they are thus subject to the instructor's copyright. You are not permitted to sell or otherwise barter notes, either to other students or to any commercial concern, without the express written permission of the course instructor. Course instructors may choose to grant or not grant such permission at their own discretion and may revoke such permission at any time.

Nondiscrimination Statement:

Discrimination is prohibited against any member of the University community on the basis of race, religion, color, sex, age, national origin, genetic information, marital status, parental status, sexual orientation, gender identify and expression, disability, or status as a veteran. If you believe you have been discriminated against, you may submit an anonymous complaint to the Office of Institutional Equity: www.purdue.edu/report-hate

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution,

stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies.

Accessibility:

I want to enable everyone to participate fully in the course. If you have a physical, psychological, medical, or learning disability that may impact your course work, please make an appointment to speak with me to discuss any adjustments. In addition, it is your responsibility to notify the Disability Resource Center of any impairment/condition that may require accommodations: www.purdue.edu/drc

Mental Health/Wellness Statement:

If you need support and information about options and resources, please contact the Office of the Dean of Students. You may call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, and stress, consider signing up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect.

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, or in need of mental health support, services are available. For help, contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours. The CAPS website also offers resources specific to situations such as COVID-19.

Basic Needs Security:

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed, and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it relates to COVID-19, students may submit requests for emergency assistance from the Critical Need Fund.

Emergency Preparation:

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructor via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Course Schedule:

Week	Day	Date	Topic	Assignment Due
1	T	1/14	*NO CLASS – Dr. Foti OOO*	
	F	1/17	Introduction	
2	T	1/21	General Neuroanatomy	
	F	1/24	General Neuroanatomy	Questions
3	T	1/28	Visual System	
	F	1/31	Visual System	Questions
4	T	24	Auditory System	
	F	2/7	*NO CLASS – Dr. Foti OOO*	
5	T	2/11	Somatosensory System & Pain	
	F	2/14	Somatosensory System & Pain	Questions
6	T	2/18	Motor System	
	F	**2/21**	**Demo – Visual System**	
7	T	2/25	Limbic System	
	F	**2/28**	**Demo – Rodent models of reward, cognition, and anxiety**	
8	T	3/4	Synaptic Communication & Plasticity	
	F	3/7	Synaptic Communication & Plasticity	Questions
9	T	3/11	Methods: Neuroimaging	
	F	3/14	Methods: Electrophysiology	Questions
10	T	3/18	*NO CLASS – Spring Break*	
	F	3/21	*NO CLASS – Spring Break*	
11	**T**	**3/25**	**Demo – MRI in humans**	
	F	**3/28**	**Demo – EEG in humans**	Research proposal outline
12	T	4/1	Applications: Emotion & Motivation	
	F	4/4	Applications: Emotion & Motivation	Questions
13	T	4/8	Applications: Attention & Learning	
	F	4/11	Applications: Attention & Learning	Questions
14	T	4/15	Applications: Social Cognition	
	F	4/18	Applications: Social Cognition	Questions
15	T	4/22	*Guest Lecture - TBD*	
	F	4/25	*Guest Lecture: Dr. Julia Chester – translational neuroscience*	Questions
16	T	4/29	**Research Presentations**	
	F	5/2	**Research Presentations**	
Finals	S	5/10	**Written Research Proposal and Final Exam due by end of Finals week**	

Weekly Readings: Listed in recommended reading order by Week

Week 1: Introduction

No assigned readings

Week 2: General Neuroanatomy

Lambert, K.G. (2018). *Biological Psychology* (pp. 33-60). Oxford University Press.

Sengupta, P. & Samuel, A. (2009). *Caenorhabditis elegans:* A model system for systems neuroscience. *Current Opinion in Neurobiology, 19,* 637-643.

Barron, H.C., Mars, R.M., Dupret, D., Lerch, J.P., & Sampaio-Baptista, C. (2021). Cross-species neuroscience: Closing the explanatory gap. *Philosophical Transactions of the Royal Society B, 376,* 20190633.

Week 3: Visual System

Lambert, K.G. (2018). *Biological Psychology* (pp. 151-170, 177, 180-181). Oxford University Press.

Norman, L.J., & Thaler, L. (2019). Retinotopic-like maps of spatial sound in primary 'visual' cortex of blind echolocators. *Proceedings of the Royal Society B, 286,* 20191910.

Week 4:

Lambert, K.G. (2018). *Biological Psychology* (pp. 170-173). Oxford University Press.

Machery, O., & Carlyon, R.P. (2014). Cochlear implants. *Current Biology, 24*(18), R878-R884.

Gilissen, S.R.J., & Arckens, L. (2021). Posterior parietal cortex contributions to cross-modal brain plasticity upon sensory loss. *Current Opinion in Neurobiology, 67,* 16-25.

Week 5:

Week 6:

Week 7:

Week 8:

Week 9:

Week 10: *No class – get some rest!*

Week 11:

Week 12:

Week 13:

Week 14:

Week 15:

Week 16: *Research presentations – good luck!*