NEU 401: CELLULAR AND MOLECULAR NEUROSCIENCE
SPRING 2025 SYLLABUS

Course Introduction

Welcome to NEU 401, an advanced course on cellular and molecular neuroscience! In this course, we will discover the fundamental cellular and molecular processes that underlie neuronal development, maintenance, and function. In particular, we will explore 9 major questions:

1. What cellular specializations contribute to neuronal function?
2. How do neurons communicate through synapses and what is synaptic plasticity?
3. What unique cellular and molecular mechanisms underlie visual perception?
4. How does the olfactory system detect and encode a nearly unlimited number of odors?
5. How does development ensure the proper wiring and function of the nervous system?
6. What is the role of genetics in nervous system function and sexual behavior?
7. How are our essential functions regulated?
8. What are the underlying causes of neurodevelopmental and neurodegenerative disorders?
9. What techniques are used to study cellular and molecular neuroscience?

Instructor Info

Instructor: Dr. Cameron Prigge (pronounced “Prigga”)
Pronouns: she/her
Email: priggeca@msu.edu
Office Hours: Thursdays 2-4pm in BPS 2205 or on Zoom by appointment

About Dr. Prigge: I received my PhD in neurophysiology from Oakland University, where I studied synaptic communication between neurons of the retina. After my PhD, I was a postdoctoral researcher at Duke University for seven years, where I investigated the cellular and molecular basis for neural circuit formation. I enjoyed doing scientific research, but ultimately decided to pursue teaching full-time because teaching students was always my favorite part! In my classroom, I strive to create an inclusive and warm learning environment where every student is encouraged to be themselves and geek out on neuroscience! The success of each student is very important to me, so please reach out to me for additional support. Outside MSU, I enjoy spending time with my husband and two kids, decorating, and gardening!

Office hours Zoom link: https://msu.zoom.us/j/2806912862
Meeting ID: 280 691 2862 **Passcode:** synapse

Learning Assistant: Gianna Sorge
Pronouns: she/her
Email: sorgegia@msu.edu
Office Hours: Mondays 5-6pm on Zoom

About Gianna: I am a current senior in the Neuroscience program here at MSU with a minor in Women and Gender Studies. I have experience as an undergraduate research assistant in the Johnson Lab, where I handled animal models and investigated the impact of estrogen through food motivation/regulation studies. This past summer, I worked with the Physics Education Research Lab to formulate suggestions for how public universities like MSU can be more inclusive and receptive

towards incoming and prospective transfer students. After I graduate this spring, I aim to take a gap year before I begin my grad applications, in which I hope to enrich my passion for research further and travel! In my free time, I enjoy film, taking horse-riding lessons, and playing NYT games :) NEU 401 is one of my favorite classes offered here at MSU, so please do not hesitate to reach out with any questions!

Tips for Success in NEU 401

Be prepared. Complete assigned readings and quizzes prior to class.

- **Ask questions.** If you have a question, there's a good chance someone else is wondering the same thing! Never assume your question is dumb or naïve. There are no bad questions!
- **Draw it out.** Organizing concepts into diagrams is great way to solidify learning.
- **Challenge yourself.** Dive deeper into topics you're interested in. Ask questions outside of class. Find out if someone on campus is doing related research and talk to them about their work.

Course Description

Overview of the cellular and molecular processes that underlie neuronal and circuit function. Topics include synaptogenesis, olfactory and visual systems, developmental wiring, neurogenetics, regulatory systems, and neurodevelopmental and neurodegenerative disorders. Three credits.

Prerequisites

NEU 301 and NEU 302. If you find that you are not proficient in skills and concepts that are needed for you to succeed in this course, please express your concerns with the instructor. They will be happy to refer you to outside resources (e.g. the writing center, tutors, peers, reputable internet resources, readings, etc.) in order to become fully prepared.

Course Structure

We will meet twice weekly, on Tuesdays and Thursdays, in Biochemistry 101 from 12:40-2pm. Recorded lectures will be posted on D2L following each class.

The course will be organized by weekly modules on D2L. Each weekly module contains the following subsections:

Pre-class materials
Items listed here are required to be completed before class. This section contains the Learning Objectives, which will be the focus of assessments. Items to complete before class may include videos, scientific papers, or other reading. There will be a short quiz on the pre-class material.

In-class materials
Lecture slides will be posted on D2L before class begins. Some days we will have in-class activities that will be posted as material on D2L. We will use Kahoot! for in-class activities. Recorded lectures will be posted on D2L following the live class.

Homework
Homework will be assigned each week based on that week's lectures and will be due the following week at the start of our Tuesday class. These worksheets will be your study guides for the exams. Please see "Assessments and Grading" for additional information.

Enrichment
Activities/readings listed here are optional and are entirely for your interest! These materials will NOT be included on assessments.

Course Materials

1. "Principles of Neurobiology" by Liqun Luo. 2nd edition. Print or online edition. Required.

Content will be provided on D2L (Pre-class materials, Quizzes, Homework, Enrichment materials, Lecture Slides and Recordings)

If you need technical assistance at any time during the course or to report a problem, you may:

- Visit the MSU Tech Support Help Site
- Visit the Desire2Learn Help Site
- Call the MSU IT Service Desk at (517) 432-6200, (844) 678-6200, or e-mail at ithelp@msu.edu

Course Schedule

A tentative course schedule for your section is provided on D2L. An accessible version of the schedule in the form of checklists is also provided on D2L.

Students are responsible for carefully consulting the schedule regularly, completing the assigned readings and the assignments by their specified dates and times.

If the schedule needs to be modified due to unforeseen circumstances, students will be alerted of changes via email to their MSU account or as a D2L announcement in a timely manner.

Assessments and Grading

28 Classes @ 2 pts each = 56 pts
10 Quizzes @ 10 pts each = 100 pts
12 Homeworks @ 30 pts each = 360 pts
5 Exams @ 90 pts each = 450 pts
966 pts total

5 Anonymous Unit Surveys @ 5 pts each
25 bonus pts total

Class Participation (total number = 28)
Each class period you attend will earn you two points. During class we do Kahoots and have in-class discussions. This is a low-stakes way of incentivizing your participation and improving your learning.

Quizzes (total number = 10)
Each week there will be a quiz on D2L on the pre-class material. You will have one attempt to take the quiz, so make sure you have completed the required reading and taken notes. Quizzes are due by the start of Tuesday class. There will be no quiz the week of exams – instead there will be an anonymous unit survey worth bonus points.

Homework (total number = 12)
Homework will be assigned each week in the form of a worksheet to be used as a study guide for the exam. It is graded on effort/completion. The worksheet will be released after the Tuesday class and is due the following Tuesday by class start. The homework key will be automatically released once you have submitted the homework. The specific due dates are listed on the schedule. The homework is graded on completion, so if you effortfully attempt each question you can get full credit; copying and pasting text from the slides or not attempting to answer part of the question will result in a loss of points. You may use late passes on homework; however, ALL homework must be turned in by the day of the exam to receive credit.

Exams (total number = 5)
There will be five exams covering ~three weeks of material each. The quizzes and homework are meant to be used as study guides to prepare you for these assessments. Exams will be taken in class on Tuesdays. They will be a combination of multiple choice, written response, matching, and fill-in-the-blank.

Grading scale

Percentage	Grade Point	Percentage	Grade Point
>90%	4.0	70-74.99%	2.0
85-89.99%	3.5	65-69.99%	1.5
80-84.99%	3.0	60-64.99%	1.0
75-79.99%	2.5	<60%	0

Late Passes
Assignments must be turned in on time to receive credit. The exception to this policy is that each student is granted three assignment extensions:

- Two 24-hour extensions
- One 1-week extension

- These extensions may be used only for quizzes or homework assignments, not exams.
  - The final homework assignment in a unit is due BEFORE the exam, so if you are using a 1-week extension on it, it will be due by the time class starts and we take the exam.
- When you upload/submit the assignment to D2L, you must add a note that states “Using one of my (24-hour or 1-week) free extensions”.
- You are also required to send your Instructor an email telling them when you have completed a late assignment, so they are aware that it is ready to grade.

You are advised to save free extensions for an unanticipated event that prevents you from submitting on time. You may not take back a previously used free extension to use again.

Inclusivity

This course will be conducted in an atmosphere of mutual respect and affirms people of all identities. The instructors were provided with a class roster with your name as you provided it to MSU. However, if you prefer to be called a different name than what is on the roster, please let Dr. Prigge know. You are also invited to share your pronouns.

Tardiness/Absence Policies

Class begins promptly at the designated time. All students are required to attend the first day of class; After that, attendance at lectures is not mandatory. However, many students have shared that they wished there was a points incentive to motivate them to come to class because their in-class experiences were much more fulfilling. Therefore, **you will earn two points for each class you attend**. If you choose to more often learn the material asynchronously, this is not a major loss of points. You do not need to reach out to me about your attendance unless it is an excused absence for lecture or it is for an exam. All lectures will be recorded and posted on D2L. Attendance at exams is required and can only be rescheduled for an excused absence or an Accommodation from the RCPD. Please see the schedule for specific exam dates.

Academic Integrity

Detailed policies on Academic Integrity can be found on D2L. In brief, plagiarism or sharing of course materials will result in an academic dishonesty report (ADR), a failing grade on those materials, and possibly additional sanctions depending on the severity of the offense. You are not allowed to obtain assignments from another student enrolled in the current or a previous semester. This includes sharing homework keys with students that have not yet completed the homework on their own. All ideas and answers must be original to you – this also means that you cannot use AI to generate homework answers. Violations discovered after course completion can result in a grade change for the course, including a failing grade. Publishing course content or answers online without the instructor's permission is intellectual property theft and academic misconduct and will result in severe penalties. So don't do it, ok?!

Mandatory Reporting

"Michigan State University is committed to fostering a culture of caring and respect that is free of relationship violence and sexual misconduct, and to ensuring that all affected individuals have access to services. For information on reporting options, confidential advocacy and support resources, university policies and procedures, or how to make a difference on campus, visit the Title IX website at www.titleix.msu.edu."

Limits to Confidentiality

"Essays, journals, and other materials submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees, including instructors, may not be able to maintain confidentiality when it conflicts with their responsibility to report certain issues based on external legal obligations or that relate to the health and safety of MSU community members and others. As the instructor, I must report the following information to other University offices if you share it with me:

- Suspected child abuse/neglect, even if this maltreatment happened when you were a child;
- Allegations of sexual assault or sexual harassment when they involve MSU students, faculty, or staff, and
- Credible threats of harm to oneself or to others.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In almost all cases, it will be your decision whether you wish to speak with that individual. If you would like to talk about these events in a more confidential setting you are encouraged to make an appointment with the MSU Counseling Center."

Letters of Recommendation

Dr. Prigge will consider providing letters of recommendation for professional and graduate schools, internships, and jobs to those students who receive ≥3.5 in the class, exhibit respect for instructors, demonstrate enthusiasm and integrity, regularly exceed expectations on assignments, and have a 3.0 or greater overall GPA. An email request for a letter of recommendation should be made at least ONE MONTH in advance of the deadline.

If Dr. Prigge agrees to write the letter, then you must then email the following items at least TWO WEEKS prior to the due date: Your CV/resume; transcript; personal statement; explanation of how your performance in NEU 401 demonstrated leadership and potential to succeed in the career path of your choosing; a list of schools you're applying to with their due dates; methods of submission along with the emails from schools detailing any online submission procedures. Please also state the semester you took the class and the section you were enrolled in.

Please note that this syllabus is a "living document" and is subject to change. If any changes are made you will be informed in class and via email.

COURSE SCHEDULE: NEU 401 Spring 2025 with Dr. Cameron Prigge (updated 1/9/25)

Important Note: Refer to the course calendar below for a schedule of topic dates and due dates. Homework details will be explained in detail within each week's corresponding learning module in D2L. If you have any questions, please contact your instructor.

For Spring 2025, this course is offered in-person. Lectures will be recorded and posted following class. Weekly quizzes, homework, and exams must be completed by the deadlines on the schedule. Reading Quizzes are due by the start of class on Tuesday. Homework and Surveys* are also due by the start of class on Tuesday (*surveys worth bonus points are italicized*). Exams are taken in-class on Tuesdays. *Due dates that do not follow the normal schedule are indicated by an asterisk. Please note this schedule is subject to change.

Required Reading: Principles of Neurobiology (2nd ed). Liqun Luo. 2020. Online or hard copy.

Week	***Dates*** *(Tues and Thurs)*	***Topic(s)***	***Assigned Reading***	***Quizzes*** *(Due by class start on specified date)*	***Homework and Surveys*** *(Due by class start on specified date)*
1	Jan 14 & 16	Introduction and Neural micronetwork motifs Cell biological and electrical properties of neurons	Syllabus and Course Schedule Luo: p. 28-49	---	Week 1 Intro Quiz (Survey) Due Fri 1/17 by 11:59pm* Week 1 Worksheet due Tues 1/21
2	Jan 21 & 23	Electrical properties of neurons: APs and AP propagation Neurotransmission at the NMJ	Luo: p. 49-61 Luo: p. 69-75	Week 2 Reading Quiz Due Tues 1/21	Week 2 Worksheet due Tues 1/28
3	Jan 28 & 30	CNS neurotransmission Cell types of the nervous system: Neurons and Glia	Lago-Baladaia *et al.* 2020 ---	Week 3 Reading Quiz Due Tues 1/28	Week 3 Worksheet due Tues 2/4

Week	***Dates*** *(Tues and Thurs)*	***Topic(s)***	***Assigned Reading***	***Quizzes*** *(Due by class start on specified date)*	***Homework and Surveys*** *(Due by class start on specified date)*
4	Feb 4 & 6	**Unit 1 Exam** Axon guidance	--- ---	---	*Bonus: Unit I Survey Due Tues 2/11*
5	Feb 11 & 13 Day of Remembrance	Synaptic specificity NO CLASS	Sanes & Zipursky 2020	Week 5 Reading Quiz Due Tues 2/11	Weeks 4+5 Worksheet due Tues 2/18
6	Feb 18 & 20	Synaptic pruning Synaptic plasticity	Sakai *et al.* 2020 Luo: p. 450-464	Week 6 Reading Quiz Due Tues 2/18	Week 6 Worksheet due Tues 2/25
7	Feb 25 & 27	**Unit 2 exam** Visual System: Retina	--- Luo: p. 136-150	---	*Bonus: Unit II Survey Due Tues 3/4* Week 7 Worksheet due Tues 3/11
8	Mar 4 & 6 Spring Break	NO CLASS NO CLASS	--- ---	---	---
9	Mar 11 & 13	Visual System: Higher order visual processing Wiring the visual system	Luo: p. 151-170 Luo: p. 173-198	Week 9 Reading Quiz Due Tues 3/11	Week 9 Worksheet due Tues 3/18

Week	***Dates*** *(Tues and Thurs)*	***Topic(s)***	***Assigned Reading***	***Quizzes*** *(Due by class start on specified date)*	***Homework and Surveys*** *(Due by class start on specified date)*
10	Mar 18 & 20	**Unit 3 exam** Olfaction	--- Luo: p. 213-237	---	Week 10 Worksheet due Tues 3/25 *Bonus: Unit III Survey Due Tues 3/25*
11	Mar 25 & 27	Developmental wiring specificity Development of axons and dendrites	Luo: p. 281-296 Luo: p. 296-313	Week 11 Reading Quiz Due Tues 3/25	Week 11 Worksheet due Tues 4/1
12	Apr 1 & 3	Development of neural maps Neurogenetics	Luo: p. 313-325 Luo: p. 326-332; 411-423	Week 12 Reading Quiz Due Tues 4/1	Week 12 Worksheet due Tues 4/8
13	Apr 8 & 10	**Unit 4 exam** Regulatory systems pt. I – eating/drinking	--- Luo: p. 375-409	---	*Bonus: Unit IV Survey Due Tues 4/15*
14	Apr 15 & 17	Regulatory systems pt. II – sleep/circadian rhythm Neurodegenerative disease pt. I	Luo: p. 375-409 Luo: p. 499-520	Week 14 Reading Quiz Due Tues 4/15	Week 13+14 Worksheet due Tues 4/22
15	Apr 22 & 24	Neurodegenerative disease pt. II Neurodevelopmental disorders	Luo: p. 533-543	Week 15 Reading Quiz Due Tues 4/22	Week 15 Worksheet due Tues 4/29

Week	***Dates*** *(Tues and Thurs)*	***Topic(s)***	***Assigned Reading***	***Quizzes*** *(Due by class start on specified date)*	***Homework and Surveys*** *(Due by class start on specified date)*
16	Apr 30 FINALS WEEK	**Unit 5 exam** **Wed Apr 30 10am-12pm**	---	---	*Bonus: Unit V Survey* *Due Fri 5/2 by 11:59pm**