Course Change Request

New Course Proposal

Date Submitted: 10/09/25 11:10 am

Viewing: NEUR 431 : Neuroinformatics Methods

Last edit: 10/20/25 9:34 am

Changes proposed by: gscott21

Programs referencing this course

: Computational Neuroscience Minor

SC-BS-NEUR: Neuroscience, BS

Are you completing this form on someone else's behalf?

Yes

Requestor:

Name	Extension	Email
Sarojini Attili	3-1686	sattili@gmu.edu

Effective Term: Spring 2026

Subject Code: NEUR - Neuroscience

Course Number: 431

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

In Workflow

1. **NEUR Chair**
2. **SC Curriculum Committee**
3. SC Assistant Dean
4. Assoc Provost-Undergraduate
5. Registrar-Courses
6. Banner

Approval Path

1. 10/08/25 4:12 pm Saleet Jafri (sjafri): Rollback to Initiator
2. 10/09/25 11:55 am Saleet Jafri (sjafri): Approved for NEUR Chair

Catalog Title: Neuroinformatics Methods

Banner Title: Neuroinformatics Methods

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 3

Default Grade Mode: Undergraduate Regular

Recommended Prerequisite(s): NEUR 101 or NEUR 327 or NEUR 335

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:

Neuroinformatics Methods combines neuroscience with data science, teaching students how to use computational tools to analyze various types of neural data, including neuron morphology, electrophysiology, and transcriptomic data. The curriculum emphasizes hands-on analysis skills across various brain data types. Students develop foundational Python programming skills and learn to use both coding and non-coding methods to analyze real datasets. The course culminates in a team project where these skills are applied to real-world neuroscience data.

Justification:

What: Creating a new 400 level neuroscience course.

Justification: In an era where neuroscience research is increasingly driven by massive datasets generated from advanced technologies like single-cell RNA sequencing, high-throughput electrophysiology, and 3D neuron imaging, the field of neuroinformatics has become indispensable. Neuroinformatics Methods addresses this critical intersection by equipping students with the computational tools and analytical frameworks necessary to process, interpret, and derive insights from diverse neural data types, including neuron morphology, electrophysiology, and transcriptomic profiles. Without such skills, neuroscientists risk being overwhelmed by data volume and complexity, hindering breakthroughs in understanding brain function, disease mechanisms, and neural circuits. This course is essential because it fosters interdisciplinary expertise, enabling students to contribute to cutting-edge research in areas like Alzheimer's disease modeling, neural network simulations, and AI-inspired brain mapping, which are pivotal for advancing both basic science and clinical applications.

The curriculum's emphasis on hands-on analysis, foundational Python programming, and a blend of coding and non-coding methods fills a significant gap in traditional neuroscience education, where computational

proficiency is often underdeveloped. By working with real-world datasets and culminating in a team-based project, students not only gain practical experience but also learn collaborative problem-solving, mirroring the team-oriented nature of modern scientific endeavors. This preparation is vital for meeting the growing demand in academia, industry, and government research institutions. Establishing this course with its own number would formalize its role in the curriculum, ensuring sustained access to students.

Does this course cover material which crosses into another department?	No

Learning Outcomes:

Proficiency in Python Programming: Students will acquire foundational skills in Python programming, enabling them to write scripts for processing, analyzing and visualizing neural data.

· Analysis of Diverse Neural Data Types: Students will learn to apply computational tools and techniques to analyze various types of brain data, such as stained brain sections, 3D reconstructions of neurons and glia, and electrophysiological data.

· Coding and Non-Coding Methods: Students will gain expertise in both coding-based (e.g., Python scripts) and non-coding methods (e.g., Allen Cell Type Knowledge Explorer) to explore and interpret real-world neuroscience datasets effectively.

· Neuroinformatics Resources and Tools: Students will become familiar with key neuroinformatics platforms, such as Allen Institute, Neuromorpho.org, MODELDB, and Hippocampome.org, and learn how to leverage these resources for analysis.

· Computational Modeling Techniques: Students will become familiar with computational modeling of neurons using software like NEURON, and use Python to build basic single compartment models enabling them to simulate and analyze cells, as well as explore the MODELDB database.

· Collaborative Team Project: Students will demonstrate their ability to integrate course concepts by completing a team-based project that involves analyzing real-world neuroscience data, producing a written report, and delivering a presentation.

· Enhance Problem-Solving and Critical Thinking: Through classwork, hands-on assignments, and the final project, students will strengthen their ability to critically analyze complex datasets and draw meaningful conclusions in a neuroinformatics context.

Will this course be scheduled as a cross-level cross listed section?

Attach Syllabus NEUR461_Syllabus.pdf

Additional Attachments	Neuroinformatics Methods Project rubric.pdf
Staffing:	Prof. Sarojini Attili, Term Assistant Professor
Relationship to Existing Programs:	IPN has crosslisted this course (under NEUR 461 special topics) with Bioengineering BENG 499), we plan to continue to crosslist. Students in CDS and Biology/Bioinformatics concentration may be interested.
Relationship to Existing Courses:	Instructor is developing a NEUR 430 Intro to Neuroinformatics course that is planned for fall 2026 or spring 2027.

Have you reached out to the Libraries to determine whether there are adequate resources to support your course? If not, please email Meg Meiman, Associate University Librarian for Learning, Research, and Engagement at mmeiman2@gmu.edu.

No

Additional Comments:	IPN is developing a neuroinformatics concentration in the major as well as a neuroinformatics minor.
Reviewer Comments	**Saleet Jafri (sjafri) (10/08/25 4:12 pm):** Rollback: As you requested.

Key: 19086

NEUR 431/BENG 499 – Neuroinformatics Methods
Spring/Fall 20XX; Section 00X
In-Person/Online

Instructor: Dr. Sarojini M. Attili
Email: sattili@gmu.edu
Meeting time: TBD
Meeting location: TBD
Office Hours: TBD

Course Overview: Neuroinformatics Methods combines neuroscience with data science, teaching students how to use computational tools to analyze various types of neural data, including neuron morphology, electrophysiology, and others. The curriculum emphasizes hands-on analysis skills across various brain data types. Students develop foundational Python programming skills and learn to use both coding and non-coding methods to analyze real datasets. The course culminates in a team project where these skills are applied to real-world neuroscience data.

Materials needed: No textbook is required. Open educational resources will be provided from various sources.

Technological Requirements: Access to Canvas, email and an internet browser.

Grading Scale:

A+ 97-100% A 93-96% A- 90-92%	B+ 87-89% B 83-86% B- 80-82%	C+ 77-79% C 73-76% C- 70-72%	D 60-69%	F 0-59%

Grading:

5 activities/assignments (30 points each)	150 points
Project – (team, outline, written report) (5+10+45 = 60 points)	60 points
Project presentation	15 points
Attendance	10 points
Total	235 points

Homework assignments: There will be a total of six homework assignments following each topic presented in class. The assignment with the lowest grade will be dropped. It is important to attend classes in order to do well on the assignments.

Midterm: There will be one take-home midterm exam. The exam will consist of hands-on activities, analysis-based tasks, and free-response questions.

Project: The course will culminate in a group project where students will apply the skills they have learned throughout the course.

Attendance: There are a total of 12 lectures in the semester. You will receive 1 point for attending each lecture on time (by 10:30 am). You can earn up to 10 attendance points (which means you will be excused for being absent for two lectures). You will not receive points if you are late to class.

Tentative Course Calendar

Week	Topic	Assignments
1/23/25	Introduction to Neuroinformatics	Assigned reading
1/30/25	Python basics and examples	Homework 1 and assigned reading
2/6/25	Allen Institute and Flywire – understanding brain maps, cell classification, transcriptomic data and cell explorer	Homework 2 and assigned reading
2/13/25	Morphological data - Allen Institute, neuromorpho.org	Homework 3 and assigned reading
2/20/25		
2/27/25	Morphological data – analyzing 3d neuronal structures	Homework 4 and assigned reading
3/6/25	Electrophysiological data - Allen Institute, Hippocampome.org and other sources	
3/13/25	Spring Recess	
3/20/25	Electrophysiological data (continued) – analyzing spike train data	Homework 5 and assigned reading
3/27/25	Data Visualization	
4/3/25	Computational modeling of neurons using NEURON software, Project overview, expectations, resources, and rubric	Homework 6 and assigned reading
4/10/25	Computational modeling of neurons continued, project outline requirements	Team information and project outline due
4/17/25	Students continue working on projects and presentations	
4/24/25	Students continue working on projects and presentations	
5/1/25	**Submit and deliver presentations**	Written report due, Presentation Due (For teams that are presenting this week)

Week	Topic	Assignments
5/8/25	**Submit and deliver presentations**	Presentations Due (For teams that are presenting this week)

Student responsibilities:

- Attend all classes on time & participate in activities/discussions.
- Complete all work by the due dates.
- Be respectful to others, limit distractions in class including side conversations, usage of devices, and don't interrupt.
- Seek help if you are struggling.

Mandatory Attendance: Students are expected to attend class on time and participate in all discussions and activities for the whole duration of each lecture. **There will be no make-up exams**.

Late Work: Unless prior arrangements are made, late work will incur a deduction of 20% and will not be accepted more than two weeks after the due date. No late work will be accepted after May 4th. Late exams and exam extensions are not accepted except in cases of emergency or illness. It is imperative that you contact me as soon as possible regarding any issues that may affect your ability to complete assignments.

Class communication: If you need to contact me, please do so using e-mail from your university account only and include the course name in the subject line and include your name in the e-mail. Check your e-mail and course Canvas account daily and before each class meeting. The instructor reserves the right to make any changes in the course she determines academically advisable. I will use e-mail and Canvas to communicate with you regarding changes related to the course, syllabus, and other essential information. You are responsible for all announcements posted and sent via Canvas and e-mail, in addition to announcements made in class.

AI (Artificial Intelligence) Tools Policy:

AI tools such as ChatGPT, Gemini, or similar platforms may be used to assist with research and editing documents for clarity and language. However, students must not use these tools to complete assignments or produce work on their behalf. All submitted work must be original and created by the student, with AI tools limited to the specified purposes of research support and language refinement. Please follow GMU AI guidelines if you choose to use AI tools for support with your coursework.

Writing Center: George Mason University provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) for supporting students as they work to construct and share knowledge through writing. See writingcenter.gmu.edu

Academic Integrity: George Mason has an honor code with clear guidelines for academic integrity. Honesty, expectation and requirement are taken very seriously, and breaches of this trust are treated gravely. Students must be responsible for their own work. When in doubt (of any kind) please ask for guidance and clarification. Cheating of any form is not tolerated. Students and faculty must take on the responsibility of dealing explicitly with violations.

Professional disposition: Students are expected to exhibit professional behavior at all times.

Disability Accommodations: If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474; ods.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs. (Please talk to the Disability Services office first; they will meet with you and help you with your individual needs. We can only activate your accommodation after you talk with Disability Services. Then talk to the instructor.)

Counseling and Psychological Services: George Mason University has a staff of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops, and outreach programs) to enhance students' personal experience and academic performance. See caps.gmu.edu

COVID Policies: All students, instructors, and TAs are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (https://www2.gmu.edu/safe-return-campus). Similarly, all students, instructors, and TAs in face-to-face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system and students will receive either a Green, Yellow, or Red email response. Only students, instructors, and TAs who receive a "green" notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

Mason Diversity Statement*

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth. An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives.

Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

* This is an abbreviated statement; full statement is available at http://ctfe.gmu.edu/professional-development/mason-diversity-statement/