NEUR3002 Syllabus

Systems, Networks, and Computational Neuroscience – B – 3cr

Fall 2026

Instructor Information

Instructor: Dr. Ian Krout, PhD

Email: ikrout3@gatech.edu

General Course Information

Description

Prerequisites: *NEUR 2010 or BMED 3100 & MATH 1552 & MATH 1553*

Recommended Conceptual Knowledge:

• Biological principles of the nervous system (structure and function of neurons, synaptic transmission, action potentials)

• Functional organization of the nervous system

• Major brain regions and their roles

• Basic math (algebra, calculus)

Recommended Skills:

• Applications of conceptual neuroscience knowledge

• Reading primary and review journal articles

• Knowledge of experimental methods and statistical processes

What are the ways we model neurons?

How do neurons arrange into systems to give rise to neurological complexity?

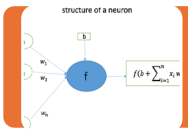
What are the advantages to computationally modelling biological systems?

How does learning, memory, and behavior, arrive through systems networks?

Welcome to NEUR 3002, an upper-level neuroscience course investigating the wonders of how animal and human behaviors emerge from small units of neurons assembled into systems and networks. Key terminology and principles involved in network operation will be introduced and examined in detail for a variety of neurobiological systems. Networks will be examined for their function in processing and interpreting information involved in generating purposeful behavioral responses. Computational approaches will be utilized to exam artificial models of biological processes. This course establishes a foundation preparing students pursuing deeper study of neurobiological networks and computational applications in the study of the nervous system.

Course Learning Outcomes

The goal of this course is for students to be able to **understand systems neuroscience through a computational lens**; however other skills are necessary in order to achieve this goal. Therefore, this course has several related learning objectives. After successfully completing this course, students should be able to:



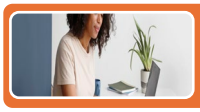
Simplify biological neurons into (computational) models that preserve key functional properties to facilitate insight and predicitions.

Create biological models using python based coding and **perform** elementary network analysis.

Describe how learning enables neural circuits to be flexible and adapative.

Explain how neurons assembled into networks interact to produce behavior.

Draw and define micro and macrocircuits that give rise to learning, memory and behavior



Generalize how neural networks solve ecological and patholgoical problems in a variety of animals.

Required Course Materials

All required readings will be uploaded on Perusal. If you are unfamiliar with the platform, we will practice its use on the first day of class. Additional textbooks/readings are available on Canvas for each unit.

Other required materials

- Point Solutions clicker software for mobile devices.
- Please bring paper and a writing utensil to class.
- Please bring a laptop to each class capable of accessing Google Collab.

All other materials (e.g., forms, all assignments, and additional resources) will be made available on Canvas.

Grading Policy:

Assignment	Weight
Projects, Homework, In-class Assignments	38% (19% per unit)
Exams	36% (18% per exam)
Quizzes	15% (7.5% per quiz)
Participation	10%
Pre & Post Surveys	1%

Grading Scale:

This course is graded on a straight scale as below – you are not competing against anyone else for your grade:

A	90-100%
B	80-89.9%
C	70-79.9%
D	60-69.9%

0.5% Bonus Added to Final Grade: 0.5% will be added to the course grade of all students if >80% of the class responds to the CIOS survey.

Grade Disputes: All students have the opportunity for their grades to be reassessed to address mistakes or oversights on part of the instructional team. These requests most be made within a week of receiving the grade and should be accompanied by a document explaining the request for reassessment. Grade disputes will not be addressed after the last instructional day for any document besides those related to what gets completed on the final exam day.

Description of Graded Components

Exams: Each unit will conclude with an exam based on material from that unit, but which may rely on material/understanding from previous/earlier units. Students will have 75 minutes to complete the exam and will require students to synthesize course material and/or apply knowledge to new situations/conditions not explicitly covered in class.

Format: All exams are in-person via Canvas during the assigned class period. Students will be allowed a crib sheet, but no other material.

Quizzes: Quizzes will be short problem sets that align with the structure of the exam questions. They will be either take-home or open-note in class.

Project: A semester-long, scaffolded, group project will be completed. This will be broken up by submissions that occur within each Unit (Checkpoints). Format will differ between units but generally requires students to work independently and collaboratively in producing reports (oral/written/visual) and python code related to neural mechanisms and systems approaches discussed in class.

In-class Assignments & Homework: These will be associated with projects or preparatory for lectures/exams. These will mostly be python script-based worksheets or Perusall readings. These will all be turned in on Canvas and checked for completion and correctness. In-class assignments are to be at very minimum started in class, therefore, if you are not present (assessed via PointSolutions) for the day of an ICA, you may not receive credit for completion.

Perusall Assignments: To engage with other students in the course and interact with readings and videos related to systems neuroscience, students will respond to interesting parts of the articles and even pose challenging questions and respond to others.

Python Scripts: To introduce the concept of computational neuroscience, python scripts will be provided to students to annotate, edit, and answer questions related to the code. Most of these will be started in class and finished independently.

Participation: Assessed in class throughout the semester, including each student's active participation in discussions during lecture/project activities, and/or via in-class 'clicker' questions. *Additionally, all students will be required to attend one TA led "journal-club" during the TAs office hours. This will be worth 2.5% of the 10% participation grade.*

Pre/Post Confidence Survey: By completing these brief surveys at the beginning and end of the class we can see if students have gained confidence in their knowledge/skills as a result of taking this course. This is helpful for improving the course and a good way for students to reflect on how much they have learned!

This course is designed to provide flexibility and autonomy in your learning experience. You will have the opportunity to tailor the course to your interests and strengths by selecting from a variety of assignments, projects, and activities. The goal is to encourage engagement, creativity, and deeper understanding of the subject matter by allowing you to choose how you meet the course objectives. You may have some flexibility in choosing which assignments or activities to complete within each bucket, depending on the course design. This system encourages a balanced approach to learning, ensuring that you engage with different types of assessments, rather than focusing solely on exams or written assignments.

Course Policies

Attendance and/or Participation and Submitted Work Policies

Attendance and Participation: As a component of your overall grade, attendance is expected for the course, with participation during class coming from Point Solutions as well as active participation in discussions.

Extensions, Late Assignments, and Re-Scheduled/Missed Exams: Rescheduling an exam must be done a minimum of one week in advance (except in emergencies) and must receive approval from the instructor. An exam missed without prior approval or an institute-granted absence will receive a zero. To miss exams due to illness a doctor's note or Dean of Student's letter is needed. Instructors can choose to issue makeup exams in a variety of formats including: oral, written/essay, and other alternative methods. All late work shall receive a 10% late penalty for every 24-hours that it is late unless otherwise discussed with the instructor. I cannot accept any work or make any changes after the final instructional day of the semester.

Submitted Work Policy: It is your responsibility to ensure that the instructional team will be able to grade your work. This means that you need to check the formatting of your work after you submit it in Canvas. If your work is blank, the document converted your text into symbols, the file format is corrupted, etc., that work cannot be assessed and will be scored as a zero (0).

Email Policy: Please email us using our direct gatech email address. You should expect a response within 24 – 48 business hrs. In addition, please use "NEUR 3002" or "BMED 4802" in the subject line to help me quickly identify the context of your email. Please do not use the Canvas email platform or Canvas messages.

Institute Approved Absences (including accommodations for religious observances):
Any letter for Institute approved absences (e.g., conference presentations, athletic events or competitions, religious absences, and/or health emergencies) should be given to the instructor as soon as possible. If you are requesting an absence due to religious observations, those could be made informally with the instructor or via the request form submitted to the registrar.

These religious absences should be requested within the first two weeks of the semester. Please see https://registrar.gatech.edu/info/institute-approved-absence-form-for-students for more information about approved absences.

Academic Integrity & Use of AI / AI Writing
Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

When assignments are marked as individual, that means there should not be any unauthorized collaboration and the final submissions for each student should be unique. This is true even if the students are originally allowed to work together in groups for some part of the assignment (the final submission must be unique/individual if marked as an individual assignment). Failure to submit individual work constitutes plagiarism.

All work is expected to be the student's own work (either individually or as part of a group effort). Therefore, the use of AI to write or significantly alter a student's work is considered Plagiarism. Students are welcome and encouraged to use AI in their writing/projects as appropriate (for feedback on writing structure, generating sources or ideas, etc.) but ultimately, ***unless specifically specified*** – student's work shall be their own and to use AI to generate work that is then not sufficiently and extensively altered/improved by the student is plagiarism. **In this class there may be assignments where AI is encouraged, please make sure you are following the guidelines for each assignment as to what, and how, AI should be used. Additionally, anytime AI is used through the semester I will ask to see the input and output and how you used this information.**

Students who admit plagiarism/academic dishonesty/etc. in a Faculty Resolution Conference (FCR) or who are convicted of plagiarism via OSI investigation will at a minimum receive a zero for that assignment AND become ineligible to re-peat/makeup the assignment or to receive any bonus points/work. This means these students cannot receive the 1% bonus from the CIOS.

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at

Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodation for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Academic and Personal Support

Center for Academic Success: http://success.gatech.edu

- 1-to-1 tutoring: https://success.gatech.edu/tutoring/
- Peer-Led Undergraduate Study (PLUS): https://success.gatech.edu/tutoring/plus/
- Academic coaching: https://advising.gatech.edu/academic-coaching
- Communication Center: http://www.communicationcenter.gatech.edu
  - Individualized help with writing and multimedia projects

Student Mental Health and Wellbeing: Georgia Tech is committed to supporting and advancing the mental health and well-being of our students. If you or someone you know has a history of mental health concerns, is having current mental health difficulties, or if you are unsure and would like a consultation, a variety of confidential services are available.

National Suicide Prevention Hotline at 988.

The Office of the Dean of Students: https://studentlife.gatech.edu/dean-students/
Smithgall Student Services Building 2nd floor
Email: studentlife@studentlife.gatech.edu
Phone: 404-894-6367

Counseling Center: http://mentalhealth.gatech.edu

Smithgall Student Services Building 2nd floor
Phone: 404-894-2575

- Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
- Their website also includes links to state and national resources.
- *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at **404-894-2575**.*

Belonging and Student Support: http://belonging.gatech.edu/studentsupport

Students' Temporary Assistance and Resources (STAR):
https://star.studentlife.gatech.edu/

- Can assist with interview clothing, food, and housing needs.

Stamps Health Services: https://health.gatech.edu
740 Ferst Dr NW, Atlanta, GA 30332
Phone: 404-894-1420

- Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition

Veteran's Resource Center: http://veterans.gatech.edu/
Phone: 404-385-2067

Georgia Tech Police: 404-894-2500

Non-Discrimination: Georgia Institute of Technology is committed to equal opportunity, a culture of inclusion, and an environment free from discrimination and harassment in its educational programs and employment.

Equal Opportunity, Compliance, and Conflict Management: https://eoc.gatech.edu/
RBI Paper Tricentennial Building, 4th floor
Phone: 404-894-5698