FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Undergraduate Programs

Department Biomedical Engineering

College COECS

*(To obtain a course number, contact **erudolph@fau.edu**)*

UUPC Approval 2-23-26
UFS Approval
SCNS Submittal
Confirmed
Banner Posted
Catalog

Prefix BME

Number 4712C

(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)

Lab Code

Type of Course Lecture/Lab

Course Title

Introduction to Computational Neuroscience

Credits *(See Definition of a Credit Hour)* 3

Grading *(Select One Option)*

Regular (X)

Sat/UnSat ( )

Effective Date *(TERM & YEAR)* Fall 2026

Course Description *(Syllabus must be attached; see Template and Guidelines)*

This course introduces the basic techniques for modeling the information processing by the neuralnetworks in the brain. Covered topics include models of single neurons, spiking and rate-based neural network models, and models of synaptic plasticity. Connections to models used in artificial intelligence will be discussed. The course offers hands-on opportunities for students to build neural network models using an interactive programming environment.

Prerequisites, with minimum grade* Permission by the instructor

Corequisites

Registration Controls *(Major, College, Level)* BME, COECS, Junior/Senior

Default minimum passing grade is D-.** **Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course

WAC/Gordon Rule Course

[ ] Yes [X] No

WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See WAC Guidelines.

Intellectual Foundations Program (General Education) Requirement *(Select One Option)*

None

General Education criteria must be indicated in the syllabus and approval attached to the proposal. See Intellectual Foundations Guidelines.

Minimum qualifications to teach course

PhD in Science or Engineering

Faculty Contact/Email/Phone

Javad Hashemi / jhashemi@fau.edu / 7-3438

List/Attach comments from departments affected by new course

Approved by / ***Date***

Department Chair	Javad Hashemi	2/4/26
College Curriculum Chair	Galan Liu	2/12/26
College Dean		2/14/26
UUPC Chair	Korey Sorge	2-23-26
Undergraduate Studies Dean	Dan Meeroff	2-23-26
UFS President		
Provost		

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

FLORIDA ATLANTIC UNIVERSITY

BME 4712C

Introduction to Computational Neuroscience

Date: TBD

Building: TBD **Room:** TBD

3 Credit(s)

Fall 2026 - 1 Full Term

Instructor Information

Yue Liu
Email: yueliu@fau.edu
Office: MC-22, 307
Office Hours: TBD
Phone:

TA Name:
Office:
Office Hours:
Telephone:
Email:

Course Description

Introduction to Computational Neuroscience
Prerequisite: Permission of instructor
Selected topics in bioengineering.
Variable title

This course introduces the basic techniques for modeling the information processing by the neural

networks in the brain. Covered topics include models of single neurons, spiking and rate-based neural network models, and models of synaptic plasticity. Connections to models used in artificial intelligence will be discussed. The course offers hands-on opportunities for students to build neural network models using an interactive programming environment.

Required Pre or Corequisites

Permission by the instructor

Related Courses

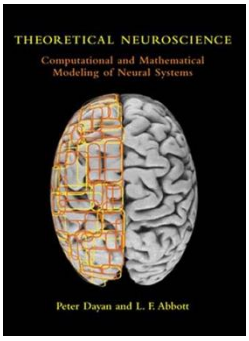
BME 6935 Comp modeling brain & behavior
This course focuses on modeling human behavior and neural data, where the proposed course focuses more on general techniques for modeling neural network in any animals and artificial systems.

BSC 4894 Brain Modeling and Simulation
This course focuses on modeling the biophysics underlying neural activity. The proposed course emphasizes more on modeling the interactions between neurons on a more abstract level, with an eye towards connecting network structure and function.

Instructional Method

In-Person w/Recorded Lecture
In-person class. Instructor will record the course for asynchronous viewing. Synchronous viewing may be an option at the discretion of the instructor. In-person attendance not required.

Required Texts/Materials



Theoretical Neuroscience: Computational And Mathematical Modeling of Neural Systems
ISBN: 978-0262541855

Authors: Peter Dayan and Larry Abbott

Publisher: MIT Press

Publication Date: September 1st, 2005

Course Topic Outline

- Motivation and prelude:
  - Why build computational models of the brain?
  - Marr's three levels
  - Historic context: connections with artificial intelligence and cognitive science
- Modeling the biophysics of single neurons
- Abstract neural network models for cognition
  - Spikes versus rate: choosing the right level of abstraction for modeling
  - Binary neural networks, chaos.
  - Firing-rate-based neural network models.
    - Feedforward neural networks and the sensory cortex
    - Recurrent neural networks and the cognitive brain: simulation and analytical solutions.
- Synaptic plasticity
  - Biophysics of synaptic plasticity
  - Modeling synaptic plasticity
    - Hebbian plasticity
    - Three-factor learning rule
  - The Hopfield model
- Artificial neural networks and the brain
  - Gradient descent and backpropagation
  - Automatic model building
  - Opening the black box of artificial neural networks

Course Objectives/Student Learning Outcomes

Course Objectives

By the end of this course, students will be able to:

1. Appreciate the importance of modeling in understanding information processing in the brain and its connection to engineering intelligent systems.
2. Understand and apply techniques to model the biophysical processes that give rise to the spiking activity of single neurons
3. Understand the mechanism by which neurons communicate, and how to model interconnected populations of neurons on different levels of abstraction.
4. Understand the mechanism by which neural networks in the brain change their structure, and simple techniques to model this plasticity.
5. Understand example models that incorporate the above elements to produce cognitive functions.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Build and analyze neural network models using programming and mathematical tools.
2. Communicate their understanding effectively through written assignments and project reports.
3. Build artificial neural systems that can exhibit cognitive behavior such as memory.

Faculty Rights and Responsibilities

Florida Atlantic University respects the rights of instructors to teach and students to learn. Maintenance of these rights requires classroom conditions that do not impede their exercise. To ensure these rights, faculty members have the prerogative to:

• Establish and implement academic standards.

• Establish and enforce reasonable behavior standards in each class.

• Recommend disciplinary action for students whose behavior may be judged as disruptive under the Student Code of Conduct University Regulation 4.007.

Disability Policy

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Course Evaluation Method

Subject to change:

Quizzes: 30%

Homework Assignments: 30%

Final Project: 40%

Extra Credit: Up to 5% possible

Code of Academic Integrity

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.

Attendance Policy Statement

Students are expected to attend all their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations, or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances, and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Religious Accommodation Policy Statement

In accordance with the rules of the Florida Board of Education and Florida law, students have the right to reasonable accommodations from the University in order to observe religious practices and beliefs regarding admissions, registration, class attendance, and the scheduling of examinations and work assignments. University Regulation 2.007, Religious Observances, sets forth this policy for FAU and may be accessed on the FAU website at www.fau.edu/regulations.

Any student who feels aggrieved regarding religious accommodations may present a grievance to the executive director of The Office of Civil Rights and Title IX. Any such grievances will follow Florida Atlantic University's established grievance procedure regarding alleged discrimination.

Time Commitment Per Credit Hour

For traditionally delivered courses, not less than one (1) hour of classroom or direct faculty instruction each week for fifteen (15) weeks per Fall or Spring semester, and a minimum of two (2) hours of out-of-class student work for each credit hour. Equivalent time and effort are required for Summer Semesters, which usually have a shortened timeframe. Fully Online courses, hybrid, shortened, intensive format courses, and other non-traditional modes of delivery will demonstrate equivalent time and effort.

Course Grading Scale

Letter Grade	Percentage
A	100 - 94%
A-	< 94 - 90%
B+	< 90 - 87%
B	< 87 - 83%
B-	< 83 - 80%
C+	< 80 - 77%
C	< 77 - 73%
C-	< 73 - 70%
Letter Grade	**Percentage**
D+	< 70 - 67%
D	< 67 - 63%
D-	< 63 - 60%
F	< 60 - 0%

Grade Appeal Process

You may request a review of the final course grade when you believe that one of the following conditions apply:

• There was a computational or recording error in the grading.

• The grading process used non-academic criteria.

• There was a gross violation of the instructor's own grading system.

University Regulation 4.002 of the University Regulations contains information on the grade appeals process

Policy on Make-up Tests, Late work, and Incompletes

It is expected that all assignments should be submitted before the deadline. However, assignments submitted after the deadline but before grading begins will receive no penalty for late submission. Assignments received after grading has begun but before grading of other assignments is completed will receive an automatic 30% penalty (meaning the best achievable grade will be 70%). Assignments received after grading is complete will not be graded and will receive a 0%. The only way to ensure you will receive full credit for the assignment is to turn it in before the deadline.

Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited.

Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

Artificial Intelligence Preamble

FAU recognizes the value of generative AI in facilitating learning. However, output generated by artificial intelligence (AI), such as written words, computations, code, artwork, images, music, etc., for example, is drawn from previously published materials and is not your own original work.

FAU students are not permitted to use AI for any course work unless explicitly allowed to do so by the instructor of the class for a specific assignment. **[Policy 12.16 Artificial Intelligence]**

Class policies related to AI use are decided by the individual faculty. Some faculty may permit the use of AI in some assignments but not others, and some faculty may prohibit the use of AI in their course entirely. In the case that an instructor permits the use of AI for some assignments, the assignment instructions will indicate when and how the use of AI is permitted in that specific assignment. It is the student's responsibility to comply with the instructor's expectations for each assignment in each course. When AI is authorized, the student is also responsible and accountable for the content of the work. AI may generate inaccurate, false, or exaggerated information. Users should approach any generated content with skepticism and review any information generated by AI before using generated content as-is.

If you are unclear about whether or not the use of AI is permitted, ask your instructor before starting the assignment.

Failure to comply with the requirements related to the use of AI may constitute a violation of the **Florida Atlantic Code of Academic Integrity, Regulation 4.001.**

Proper Citation: If the use of AI is permitted for a specific assignment, then use of the AI tool must be properly documented and cited. For more information on how to properly cite the use of AI tools, visit **https://fau.edu/ai/citation**

AI Language Specific To This Course

AI Flexible: The use of AI to assist in work assigned in this specific course is permitted only for specific assignments as indicated by the instructor. Use must be properly documented and cited per instructor guidelines (https://fau.edu/ai/citation).

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual therapy, group therapy, and crisis services, to name a few - offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/

Student Support Services and Online Resources

- Center for Learning and Student Success (CLASS)
- Counseling and Psychological Services (CAPS)
- FAU Libraries
- Math Learning Center
- Office of Information Technology Helpdesk
- Center for Global Engagement
- Office of Undergraduate Research and Inquiry (OURI)
- Science Learning Center
- Speaking Center
- Student Accessibility Services
- Student Athlete Success Center (SASC)
- Testing and Certification
- Test Preparation
- University Academic Advising Services
- University Center for Excellence in Writing (UCEW)
- Writing Across the Curriculum (WAC)

Title IX Statement

In any case involving allegations of sexual misconduct, you are encouraged to report the matter to the University Title IX Coordinator in the Office of Civil Rights and Title IX (OCR9). If University faculty become aware of an allegation of sexual misconduct, they are expected to report it to OCR9. If a report is made, someone from OCR9 and/or Campus Victim Services will contact you to make you aware of available resources including support services, supportive measures, and the University's grievance procedures. More information, including contact information for OCR9, is available at **https://www.fau.edu/ocr9/title-ix/**. You may also contact Victim Services at **victimservices@fau.edu** or 561-297-0500 (ask to speak to an Advocate) or schedule an appointment with a counselor at Counseling and Psychological Services (CAPS) by calling 561-297-CAPS