FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Undergraduate Programs

Department Biomedical Engineering

College COECS

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

UUPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix BME

Number 4364

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

Lab Code

Type of Course: Lecture

Course Title: Neuromechanics

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

Effective Date *(TERM & YEAR)*: Fall, 2025

Grading *(Select One Option)*

Regular (●)

Sat/UnSat ( )

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

This course provides an interdisciplinary introduction to neuroengineering, a field at the intersection of neuroscience, engineering, and computational science. Students will explore the fundamental principles of neural systems, signal processing, and neuroengineering technologies. The course emphasizes the integration of engineering techniques with neuroscience to understand and manipulate neural systems for medical and technological applications.

Prerequisites, with minimum grade*

PCB4843C, with mimimum grade "C"

Corequisites

N/A

Registration Controls *(Major, College, Level)*

BME, COECS, Senior

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

WAC/Gordon Rule Course

☐ **Yes** ☑ **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 / 561.297.3438

List/Attach comments from departments affected by new course

Approved by / ***Date***

Department Chair: Javad Hashemi — 11/7/2024

College Curriculum Chair: Galan Liu — 11/21/2024

College Dean: — 11/21/24

UUPC Chair:

Undergraduate Studies Dean:

UFS President:

Provost:

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

Department of Computer & Electrical Engineering and Computer Science
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
Neuromechanics BME 4364 Website: Canvas.fau.edu	# of credit hour: 3
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Prerequisites: PCB4843C, with minimum grade "C"	
3. Course logistics	
Term: Spring 2025 *Class location and time: TBD*	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Email address*	Hersh J Chaitin, Ph.D. TBD TBD TBD
5. TA contact information	
TA's name *Office address* *Office Hours* *Contact telephone number* *Email address*	NA
6. Course description	
This course provides an interdisciplinary introduction to neuromechanics, a field at the intersection of neuroscience, engineering, and computational science. Students will explore the fundamental principles of neural systems, signal processing, and neuroengineering technologies. The course emphasizes the integration of engineering techniques with neuroscience to understand and manipulate neural systems for medical and technological applications.	
7. Course objectives/student learning outcomes/program outcomes	
• *Understand the basic principles of neuroanatomy, neurophysiology, and neural engineering.* • *Evaluate the latest advancements in neuroengineering research and technology.* • *Apply engineering principles to design and develop innovative solutions for neural repair and regeneration.* • *Critically analyze ethical and regulatory issues related to neuroengineering.*	

• *Communicate effectively about neuroengineering concepts and applications.*	

8. Course evaluation method

Assessment: Assessment methods include exams, weekly laboratory reports, research papers, class presentations. Students may also be evaluated based on their participation in discussions and group projects.

4364- Undergraduate Student Assessment

- In-class quizzes (20%)
- Midterm examination (40%)
- Weekly Lab Reports (20%)
- Final 1-page summary + Presentation (20%)

Course Format: The course is typically structured around lectures, laboratory sessions, and interactive discussions. Students will have the opportunity to engage with cutting-edge research articles, case studies, and planned guest lectures from experts in the field.

Final Project:

Undergraduate students currently enrolled in this course, with a strong interest in neuroscience/biomechanics research will prepare a course relevant 1-page paper experiment design in the student's field of interest. Undergraduate students will also present an end-of-semester 5 minute in-class presentation on their work. This final research paper and presentation will make up 20% of the students final grade.

9. Course grading scale

90 and above: "A", 87-89: "A-", 83-86: "B+", 80-82: "B", 77-79 : "B-", 73-76: "C+", 70-72: "C", 67-69: "C-", 63-66: "D+", 60-62: "D", 51-59: "D-", 50 and below: "F."

10. Policy on makeup tests, late work, and incompletes

There are no late assignments. There will be no make-up exams unless specifically approved by the instructor in advance or excused by official documentation (i.e. hospital discharge, police report…).

Regularly scheduled doctors' appointments are not acceptable excuses for missing an exam.

WE WILL ALWAYS MAKE ACCOMMODATION FOR CONFLICTS WITH RELIGIOUS OBSERVANCE, BUT THESE MUST BE COMMUNICATED WITH THE INSTRUCTOR IN ADVANCE OF THE EXAM.

11. Special course requirements

NA

12. Classroom etiquette policy

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.

13. Attendance policy statement

Students are expected to attend all of 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.
Special note: *"After two full weeks of face to face instruction with consecutive 'no show' of any students in person in the classroom, the modality of this course section may be changed to remote instruction only at the discretion of the university."*

14. Disability policy statement

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/.

15. 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 counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/

16. Code of Academic Integrity policy statement

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. If your college has particular policies relating to cheating and plagiarism, state so here or provide a link to the full policy—but be sure the college policy does not conflict with the University Regulation.

17. Required texts/reading

To reduce costs for our students, we strongly encourage you to explore the adoption of open educational resources (OER), textbooks and other materials that are freely accessible. We also encourage you to clearly state in the syllabus if course materials are available on reserve in the Library.
Course Materials: **Biomedical Engineering Fundamentals, Third Edition 3rd Edition** by Myer Kutz (Author)
18. Supplementary/recommended readings
Lecture notes.
19. Course topical outline, including dates for exams/quizzes, papers, completion of reading

Week-by-Week Class Schedule:

Week 1: Syllabus Overview

- Overview of the Syllabus and Course Expectations
- Introduction to Neurotissue Engineering
- Neuroanatomy and Neurophysiology

Week 2: Neuroanatomy & Physiology

- Anatomy & Physiology - Central & peripheral nervous tissue
- Histology - Cells & structures of nervous tissue (IHC, IF)
- Immunology – Immunology of CNS & PNS tissue

Weeks 3: Electrophysiology & Neurogenetics

- Electrophysiology - Bioelectricity and Neuromodulation
- Neurogenetics – Regional Differentiation
- Neurogenetics – Cell Metabolism

Weeks 4: Principles of Nervous Tissue Engineering

- Principles of tissue engineering
- Biomaterials for tissue regeneration
- Scaffold design and fabrication techniques

Weeks 5: Neural Cell Culture Techniques

- Cell-Based Approaches in Neural Repair
- Isolation and culture of primary neural cells
- Maintenance and characterization of neural cell cultures
- Differentiation of stem cells into neural lineages

Weeks 6: Biomaterials for Neurotissue Engineering

- Properties of biomaterials for neural regeneration
- Biomimetic approaches in neurotissue engineering
- Controlled release systems for neurotrophic factors

Weeks 7: MIDTERM REVIEW & EXAM

Weeks 8: CNS Damage & Endogenous Repair Mechanisms (part 1)

- CNS Neural Regeneration and Plasticity
- Spinal cord injury repair
- Axon guidance and growth factor delivery

Weeks 9: PNS Nerve Damage & Endogenous Repair Mechanisms (part 2)

- PNS Neural Regeneration and Plasticity
- Cardiovascular damage
- Pulmonary damage
- Musculoskeletal damage (sensory & motor)

Weeks 10: Stem Cells in Neurotissue Engineering

- Introduction to stem cell biology
- Induced pluripotent stem cells (iPSCs)
- Stem cell-based therapies for neural repair

Weeks 13: Neuroelectronic Interfaces

- Introduction to neuroprosthetics
- Brain-machine interfaces (BMIs)
- Electroactive biomaterials for neural interfaces

Week 14: Biomedical Devices & Interventions

- Therapeutic Applications of Neurotissue Engineering
- Interventions for stroke, eye damage, hearing loss, PND
- Research and Development – Biosensors, translational models, cell therapies

- **IN-CLASS PRESENTATIONS**

Week 15: Emerging Trends and Ethical Considerations

- Emerging technologies in neurotissue engineering
- Ethical issues in neural regeneration research
- Regulatory considerations and future directions
- **IN-CLASS PRESENTATIONS**

Week 15: FINAL REVIEW

- **IN-CLASS PRESENTATIONS**

Week 16:

- **FINAL EXAM**
- **IN-CLASS PRESENTATIONS**