FLORIDA ATLANTIC UNIVERSITY	**NEW COURSE PROPOSAL** **Graduate Programs**	UGPC Approval ______ UFS Approval ______ SCNS Submittal ______ Confirmed ______ Banner ______ Catalog ______
	Department Biomedical Engineering **College** Engineering and Computer Science (*To obtain a course number, contact* ***erudolph@fau.edu***)	

Prefix BME **Number** 5365	(*L = Lab Course; C = Combined Lecture/Lab; add if appropriate*) **Lab Code**	**Type of Course** Lecture	**Course Title** Advanced Neuromechanics

Credits (*See Definition of a Credit Hour*) 3 **Effective Date** (*TERM & YEAR*) Spring 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 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.

Prerequisites Undergraduate course in Biomechanics or equivalent or instructor's permission. ***Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.***	**Academic Service Learning (ASL) course** ☐ Academic Service Learning statement must be indicated in syllabus and approval attached to this form. **Corequisites** N/A **Registration Controls** (*For example, Major, College, Level*) BME, COECS, Graduate
Minimum qualifications needed to teach course: Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	**List textbook information in syllabus or here** Biomedical Engineering Fundamentals, Third Edition 3rd Edition by Myer Kutz.
Faculty Contact/Email/Phone Dr. Hersh J Chaitin/hersh.chaitin@gmail.com	**List/Attach comments from departments affected by new course** NA.

Approved by		***Date***
Department Chair	Janaed Chaitin	9/4/24
College Curriculum Chair	Francisco Presuel-Moreno Digitally signed by Francisco Presuel-Moreno DN: cn=Francisco Presuel-Moreno, o=Florida Atlantic University, ou, email=fpresuel@fau.edu, c=US Date: 2024.09.23 11:20:23 -04'00'	9/23/24
College Dean	Raquel Assis	9/21/24
UGPC Chair		
UGC Chair		
Graduate College Dean		
UFS President		
Provost		

Email this form and syllabus to UGPC@fau.edu 10 days before the UGPC meeting.

BME 5365

Advanced Neuromechanics

Date & Time: TBD
3 credits

Spring 2025
Dr. Hersh J Chaitin, Ph.D.
Classroom: TBD
Office: TBD
Telephone: TBD
Email: TBD

Office instructor/TA	TBD
TA Office hours	TBD
TA email:	TBD
Telephone	TBD
Email	TBD

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.

- *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.*

Instructional Method

This class is designated as one mode: In person. Attendance: Optional but highly recommended.

Prerequisites/Corequisites

Undergraduate course in Biomechanics or equivalent or instructor's permission.

Building: TBD

Room: TBD

Days: TBD

Time: TBD

Course Evaluation Method

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

- 10 Weekly in-class quizzes (20%)
- Midterm examination (30%)
- Final examination (30%)
- Final Project (20%)

Course Format: The course is structured around lectures, laboratory 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: Graduate students currently engaged with neuroscience/biomechanics research labs at FAU will further advance their work by preparing a research relevant Methods and Materials document, in the student's field of study. The written document will accompany an end-of-semester 10-minute in-class presentation on their work.

Course Grading Scale

Grade 90 and above: "A", 86-89: "A-", 82-85: "B+", 78-81: "B", 74-77 : "B-", 73-76: "C+", 69-72: "C", 65-68: "C-", 61-64: "D+", 57-60: "D", 51-56: "D-", 50 and below: "F."

Policy on Makeup Tests, Late Work, and Incompletes (if applicable)

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.

Classroom Etiquette Policy (if applicable)

Class attendance optional but recommended.

Attendance Policy

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.

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/

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/.

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.

Required Texts/Readings

Biomedical Engineering Fundamentals, Third Edition 3rd Edition
by Myer Kutz (Author)

Tentative Topical Outline

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**