NEW COURSE PROPOSAL
Graduate Programs

FLORIDA ATLANTIC UNIVERSITY
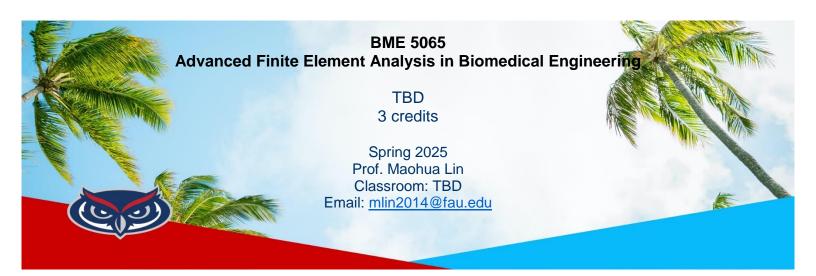
Department Biomedical Engineering

College Engineering and Computer Science
(To obtain a course number, contact erudolph@fau.edu)

UGPC Approval _____

UFS Approval _____

SCNS Submittal _____

Confirmed _____

Banner _____

Catalog _____

Prefix BME	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**
Number 5065	

Type of Course Lecture

Course Title Advanced Finite Element Analysis in Biomedical Engineering

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 is designed for graduate students to apply advanced finite element analysis (FEA) techniques in the biomedical field. It covers simulation cases for the spine, shoulder, hand, hip joint, knee, ankle, feet, and head, along with disease and implant simulations. Students will also process CT images into 3D models, perform simulations using Ansys Workbench and FEBio, and explore machine learning integration for enhanced simulation outcomes. Graduate students will engage in rigorous research projects and produce technical papers on advanced topics.

Prerequisites

Basic knowledge of biomechanics and familiarity with computer-aided design (CAD) software 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
• Finite Element Procedures by Klaus-Jürgen Bathe.
• Finite Element Analysis for Biomedical Engineering Applications by Z. Yang.

Faculty Contact/Email/Phone

Prof. Maohua Lin/mlin2014@fau.edu

List/Attach comments from departments affected by new course

NA.

Approved by		Date
Department Chair	*[signature]*	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 11:14:58 -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 5065
Advanced Finite Element Analysis in Biomedical Engineering

TBD
3 credits

Spring 2025
Prof. Maohua Lin
Classroom: TBD
Email: mlin2014@fau.edu

Office instructor/TA	TBD
TA Office hours	TBD
TA email:	TBD
Telephone	
Email	mlin2014@fau.edu

Course Description

This course is designed for graduate students to apply advanced finite element analysis (FEA) techniques in the biomedical field. It covers simulation cases for the spine, shoulder, hand, hip joint, knee, ankle, feet, and head, along with disease and implant simulations. Students will also process CT images into 3D models, perform simulations using Ansys Workbench and FEBio, and explore machine learning integration for enhanced simulation outcomes. Graduate students will engage in rigorous research projects and produce technical papers on advanced topics.

Instructional Method

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

Prerequisites/Corequisites

Basic knowledge of biomechanics and familiarity with computer-aided design (CAD) software or instructor's permission.

Building: TBD

Room: TBD

Days: TBD

Time: TBD

Course Evaluation Method

- Midterm Exam: 15%

- Final Exam: 20%

- Laboratory Reports: 10%

- Graduate Research Project: 40% (Independent project with final presentation and report)

- Research Paper and Presentation: 15%

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)

Homework due one week after assignment in class. Late homework is accepted after one day with 50% penalty and not accepted after that unless there is a justifiable reason for late submission.

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

- *Finite Element Procedures* by Klaus-Jürgen Bathe.

- *Finite Element Analysis for Biomedical Engineering Applications* by Z. Yang.

- *Introduction to Finite Element Analysis and Design* by Nam-Ho Kim, Bhavani V. Sankar, and Ashok V. Kumar.

- Additional journal articles and research papers provided throughout the course.

Tentative Topical Outline

- **Weeks 1-2**: Advanced FEA Techniques in Biomedical Engineering.

- **Weeks 3-4**: CT Imaging to 3D Modeling for Biomedical Simulations.

- **Weeks 5-6**: FEA Simulation of Complex Spine Models using Ansys Workbench.

- **Weeks 7-8**: Shoulder and Knee Biomechanics: Advanced Simulation Techniques.

- **Weeks 9-10**: FEBio Simulations and Applications in Shoulder and Knee Implants.

- **Weeks 11-12**: Disease and Implant Simulations for Spine, Knee, and Ankle.

- **Weeks 13-14**: Brain Injury and Skull Implant Simulation using FEA./ Machine Learning Integration in Advanced FEA.