FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

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

Number 5586

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

Type of Course Lecture/Lab

Course Title Microfabrication Technology

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)*
Students will gain a comprehensive understanding of microfabrication and Microelectromechanical Systems (MEMS) technology, including fundamental relevant knowledges. They will apply this knowledge to design and analyze MEMS and use advanced measurement techniques, including spectroscopic and physical methods, to characterize micro- and nanostructures. Students will also address challenges in integrating microdevices, develop practical skills in laboratory settings, and apply critical thinking to solve complex problems related to microfabrication and MEMS devices.

Prerequisites
EEL3111, with minimum grade C

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
NA.

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
No text book required.

Faculty Contact/Email/Phone
Prof. Mike Kim/kimm@fau.edu

List/Attach comments from departments affected by new course
There is no other course affected.

Approved by		***Date***
Department Chair	Javad Hashemi	3/10/25
College Curriculum Chair	Francisco Presuel-Moreno	3/11/2025
College Dean	Raquel Assis	3/11/2025
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.

Department of Biomedical Engineering, Florida Atlantic University Course Syllabus

1. Course title/number, number of credit hours

Microfabrication Technology, BME 5586	3 credit hours

2. Instructional Method

This class will be conducted in class and cleanroom, and there is no remote option.

3. Course pre-& co-requisites and where the course fits in the program of study

Prerequisite:
EEL3111, with minimum grade C

4. Course logistics

Term:
Time & Location:

5. Instructor contact information

Instructor's Name	Mike Kim	Sarah Du
Office	EW - 181	EW175
Office Hours		
Telephone number	561) 297-3442	561-297-3441
Email	kimm@fau.edu	edu@fau.edu

Instructor's Name	Waseem Asghar	Vivian Merk	
Office	EE96 - 435	ST - 237	
Office Hours			
Telephone number	561-297-3728	561-297-3819	
Email	wasghar@fau.edu	vmerk@fau.edu	

6. TA contact information

TA's Name			
Office			
Office Hours			
Telephone number			
Email			

7. Course description

Course Description:
Microfabrication Technology course provides a comprehensive introduction to microfabrication and MEMS (Microelectromechanical Systems) technologies, focusing on the techniques and processes used to create micro- and nanodevices. Students will learn the fundamental principles of microfabrication, including lithography, etching, deposition, and bonding methods, and their applications in the development of a wide range of micro- and nanostructures.

8. Course objectives/student learning outcomes/program outcomes

Course objectives	Students will gain a comprehensive understanding of microfabrication and MEMS technology, including fundamental relevant knowledges. They will apply this knowledge to design and analyze Microelectromechanical Systems (MEMS) and use advanced measurement techniques, including spectroscopic and physical methods, to characterize micro- and nanostructures. Students will also address challenges in integrating microdevices, develop practical skills in laboratory settings, and apply critical thinking to solve complex problems related to microfabrication and MEMS devices.
Student learning outcomes & relationship to ABET 1-7 objectives	Student Learning Outcomes: (numbers in parentheses indicate correlation of the outcome with the appropriate program assessment outcomes 1-7) 1. Understand and apply various microfabrication techniques for the development of micro- and nanodevices. (1,2,6,7) 2. Analyze the design considerations and fabrication challenges associated with MEMS technology. (1,2,7) 3. Demonstrate proficiency in the use of equipment and processes involved in microfabrication. (2,6) 4. Function effectively in teams and communicate their ideas to their peers. (3,4,5)

9. Course evaluation method

Module 1 (report, presentation, assignment and/or quiz): XX pts
Module 2 (report, presentation, assignment and/or quiz): XX pts

Final Presentation: XXpts

10. Course grading scale

Grading Scale:

A 93-100	C+ 70-75	D- 45-50
A- 90-93	C 65-70	F <45
B+ 85-90	C- 65-60	
B 80-85	D+ 55-60	
B- 75-80	D 50-55	

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

Submission Deadline
Submission is always due on or before the end of the due date (EOD).

Makeup Tests/Presentations are allowed only if there is solid evidence of a medical or otherwise serious emergency that prevented the student from participating.

Incomplete grades are against the department's policy. Unless there is solid evidence of a medical or otherwise serious emergency situation, incomplete grades will not be given.

Late Submissions

Late work is not acceptable.

12. Special course requirements

13. 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, are to be turned off in class sessions.

14. 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.

15. 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.

16. 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/*

17. Counseling and Psychological Services 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/

18. 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 unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

Cell phones are not allowed during exams. If cell phones are detected during any exam periods, this will result in a **grade of "zero" on that exam and a note in the student's academic file.**

19. Required texts/reading/Lab kits

No text book required.

20. Supplementary/recommended readings

Will be provided by the instructor.

21. Course topical outline, including dates for exams/quizzes, papers, completion of reading

Key topics

- Fundamentals of Microfabrication: Overview of the principles and processes involved in the fabrication of microdevices, including material properties and fabrication techniques.
- Lithography Techniques: Detailed study of photolithography, soft lithography, electron-beam lithography, and other patterning methods used to define microstructures.
- Etching Processes: Implementation of both wet and dry etching techniques for material removal and pattern transfer.
- Deposition Methods: Introduction to thin-film deposition methods such as chemical vapor deposition (CVD), physical vapor deposition (PVD), and electroplating.
- MEMS Technology: Exploration of the design, fabrication, and application of MEMS devices, including sensors, actuators, and microfluidic systems.
- Nanofabrication Techniques: Overview of advanced techniques for fabricating nanostructures and devices.
- Measurement Techniques:
    - Spectroscopic Methods: Use of techniques such as atomic force microscopy (AFM), scanning tunneling microscopy (STM), and X-ray photoelectron spectroscopy (XPS) to analyze and characterize micro- and nanostructures.
    - Physical Measurement Methods: Application of methods like profilometry and interferometry to measure thickness, surface topography, and other physical properties of fabricated structures.

The detailed schedule

Week 1: Introduction to Microfabrication

- Overview of microfabrication principles and applications
- Materials used in micro- and nanofabrication

Week 2: Lithography Basics
- Introduction to photolithography
- Photoresists and their properties

Week 3: Advanced Lithography Techniques
- Electron-beam lithography
- Other patterning methods and their applications

Week 4: Wet Etching Processes
- Principles of chemical etching
- Applications and examples

Week 5: Dry Etching Processes
- Plasma etching and reactive ion etching
- Comparison with wet etching

Week 6: Deposition Methods: Overview
- Introduction to thin-film deposition techniques
- Chemical Vapor Deposition (CVD)

Week 7: Deposition Methods: Advanced Techniques
- Physical Vapor Deposition (PVD)
- Electroplating processes and applications

Week 8: MEMS Technology: Basics
- Introduction to Microelectromechanical Systems (MEMS)
- MEMS design and fabrication

Week 9: MEMS Applications
- Sensors and actuators
- Microfluidic systems and their uses

Week 10: Nanofabrication Techniques: Overview
- Introduction to nanofabrication methods
- Nanoimprint lithography

Week 11: Advanced Nanofabrication Techniques
- Molecular beam epitaxy
- Focused Ion Beam Milling
- Other cutting-edge techniques

Week 12: Measurement Techniques: Spectroscopic Methods
- Atomic Force Microscopy (AFM)
- Introduction to Spectroscopic Surface Measurement Techniques (including STM)

Week 13: Measurement Techniques: Physical Methods I
- Optical Profilometry: principles and applications
- Profilometry: surface topography and thickness measurement

Week 14: Measurement Techniques: Physical Methods II
- Profilometry: surface topography and thickness measurement
- Ellipsometry and its uses

Week 15: Integration and Packaging
- Challenges in integrating microfabricated components
- Strategies for effective packaging

Week 16: Review and Project Presentations
- Review of key concepts and techniques
- Student presentations of key research paper review