FAU

FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department Ocean & Mechanical Engineering

College COECS

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

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

Prefix BME

Number 6585

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

Type of Course
Lecture

Course Title
Advanced Topics in Microfluidics and BioMEMS

Credits *(Review Provost Memorandum)*
3

Effective Date *(TERM & YEAR)*
Fall 2020

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*
A comprehensive introduction to microfluidics, micro-electro-mechanical systems (MEMS) and microfabrication techniques. Advanced topics on the applications of microfluidics and MEMS for bioengineering problems (bioMEMS). Topics include fluid properties, flow behavior, Electrokinetics, photolithography, soft lithography, flow control, manipulation and characterization of biological cells using engineered microdevices.

Prerequisites
EML 3701 and MAP 3305, or permission of instructor

Corequisites

Registration Controls *(Major, College, Level)*
Graduate students and seniors in the College of Engineering and Computer Science

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

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 required textbook. Suggested Reference:
Albert Folch, 'Introduction to BioMEMS', CRC Press, 2012.
ISBN-13: 978-1-439818398

Faculty Contact/Email/Phone
Dr. Sarah Du
edu@fau.edu / (561) 297-3441

List/Attach comments from departments affected by new course
None

Approved by		***Date***
Department Chair	[signature]	11/18/2019
College Curriculum Chair	Ramesh Teegavarapu	11/22/2019
College Dean	Mihaela Cardei	11/22/2019
UGPC Chair		
UGC Chair		
Graduate College Dean		
UFS President		
Provost		

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

GRADUATE COLLEGE
NOV 25 2019

Department of Ocean and Mechanical Engineering
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
BME 6585 Advanced Topics in Microfluidics and BioMEMS	3 credit hours

2. Course prerequisites, corequisites, and where the course fits in the program of study

Prerequisites:

EML 3701 Fluid Mechanics and MAP 3305 Engineering Mathematics, or permission of instructor

3. Course logistics

Term: Fall/2020

Class location and time:

All course assignments are required to be submitted online using Canvas.

4. Instructor contact information

Instructor's name	Dr. Sarah Du
Office address	EW 36 RM 175
Office Hours	W, 03:00 PM – 04:00 PM
Contact telephone number	561-297-3441
Email address	edu@fau.edu

5. TA contact information

TA's name	
Office Hours	
Email address	

6. Course description

A comprehensive introduction to microfluidics, micro-electro-mechanical systems (MEMS) and microfabrication techniques. Advanced topics on the applications of microfluidics and MEMS for bioengineering problems (bioMEMS). Topics include fluid properties, flow behavior, Electrokinetics, photolithography, soft lithography, flow control, manipulation and characterization of biological cells using engineered microdevices.

7. Course objectives/student learning outcomes/program outcomes

Course objectives	This course is designed to introduce the students to science and technology of microfluidics, including concepts and principles of flow, transport and special phenomena at microscale, design and fabrication techniques, as well as the state-of-the-art applications of microfluidics for bioengineering problems. Students will evaluate the impacts of microfluidics and bioMEMS in life sciences.
Student learning outcomes & relationship to ABET 1-7 objectives	1. The students will be familiar with the concepts of laminar flow, viscosity, surface tension, dimensionless numbers, Navier-Stokes equations. (ABET 1) 2. The students will be able to interpret principles in microfluidics and dimensionless numbers. (ABET 1) 3. The students will be able to list real-life applications of microfluidics and bioMEMS devices. (ABET 2) 4. The students will be able to design and fabricate simple microfluidic components and devices. (ABET 2) 5. The students will be able to perform microfluidic experiments and analyze the experimental results. (ABET 5, 6) 6. The students will be able to effectively communicate in scientific and technological endeavor through technical report writing. (ABET 3, 5)

8. Course evaluation method

Homework (4) (20%)
Mid-term exam (30%)
Lab reports (30%)
Final group project (20%)

The minimum grade required to pass the course is C.

9. Course grading scale

Range	
>= 95	A
90-94	A-
85-89	B+
80-84	B
75-79	B-
70-74	C+

65-69	C
60-64	C-
55-59	D+
50-54	D
45-49	D-
< 45	F

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

Submission Deadline
All submissions to Canvas*.

*In terms of any emergency that may lead to delay for failure in online submission, submit to Dr. Du's email address: edu@fau.edu before the due date.

Late Submissions
Late work is NOT acceptable.

Make-up Exam Policy
Makeup tests are given only if there is solid evidence of a medical or otherwise serious emergency that prevented the student of participating in the exam. Makeup exam should be administered and proctored by department personnel unless there are other pre-approved arrangements.

11. Special course requirements

Access to COECS computer system.

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.
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.***

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.

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. Honor code policy

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

No cell phones are allowed during exams (OME department policy)

16. 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/

17. Required texts/reading

No Required textbooks.

Reference books:

1. Albert Folch, 'Introduction to BioMEMS', CRC Press, 2012.

2. Nam-trung Nguyen, Seven Wereley, 'Fundamentals and Applications of Microfluidics', Artech house, 2006. (Please note: an electronic version of this book is available through FAU Electronic Resource General Collection).

Lectures, Web of Science, and electronic journals will be provided and shared through CANVAS.

18. Course topical outline, including dates for exams, papers, completion of reading

Course Topics:

1. Introduction to microfluidics
2. Fluid mechanics at small scales: scaling effects, dimensionless numbers, laminar flow, surface tension, capillary flow, fluids in electric fields
3. Materials and fabrication for MEMS and bioMEMS
4. Materials and fabrication for microfluidics
5. *Lab 1 - device fabrication*
6. Microfluidics for flow control: practical concerns, valves, pumps, gradient generator, mixers, microflow sensor
7. *Lab 2 – surface tension*
8. *Lab 3 – laminar flow and mixing*
9. Molecular biology on a chip
10. Cell-based chips: cell counting, sorting, trapping, cellular mechanics
11. Biomimetic chips: blood vessels, lung-on-a-chip

Test Dates:

1. Mid-term exam (open book)
2. Lab reports (3) - due within one week from lab date (online students, due within one week from video post)
3. Final group project
    a. Mini literature review paper
    b. Presentation