Department of Ocean and Mechanical Engineering
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
BME 4580 Intro to Microfluidics and MEMS	3 credit hours

2. Course prerequisites, corequisites, and where the course fits in the program of study
Prerequisites: EML 3701- Fluid Mechanics or equivalent MAP 3305 – Engineering Mathematics or equivalent All with a grade of C or above

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 *Office address* *Office Hours* *Contact telephone number* *Email address*	Dr. Sarah Du EW 36 RM 175 W, 03:00 PM – 04:00 PM 561-297-3441 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. Topics include laminar flow, viscosity, surface tension, dimensionless numbers, Electrokinetics, photolithography, soft lithography, flow control, and flow sensors of micrometer scale.

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 basic concepts

	and principles of flow, transport and special phenomena at microscale, as well as basic design and fabrication concepts of microfluidics and MEMS devices.
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 basic principles in microfluidics and dimensionless numbers. (ABET 1) 3. The students will be able to list real-life applications of microfluidics and MEMS 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 basic 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. 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)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 110 (561-799-8585) —and follow all SAS procedures.

14. 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)

15. 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/

16. Required texts/reading

No Required textbooks.

Reference books:

1. 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.

17. 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. Microfabrication and micromachining techniques
4. Materials and fabrication for microfluidics
5. *Lab 1 - microfluidics fabrication*
6. Practical concerns in microfluidics
7. *Lab 2 – surface tension*
8. Flow control at microscale: valve, pump, mixer, gradient generator
9. *Lab 3 – laminar flow*
10. Microflow sensor

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 presentation