

BME 5151 - Intro to BioMEMS and Medical Microdevices  
 Spring 2025, Thursdays, 3:35 p.m. - 5:30 p.m., Two Credits, Prof. Steven S. Saliterman

Classes will be in MCB 2-120					
Week	Date	Lecture	Topic	Supplimental Reading (Avaible on Website)	Projects
1	1/23/2025	1st hr.	Course Introduction		
		2nd hr.	Silicon Microfabrication Part 1 - Lithography & Etching	1. Book Chapter: Saliterman S., <i>Silicon Microfabrication</i> , Ch 2. 2. Book: Ghodssi, R. <i>MEMS Materials and Processes Handbook</i> 2011.	
2	1/30/2025	1st hr.	Silicon Microfabrication Part 2 - Deposition & Wet Etching	1. Karimi, K. <i>Micro- &amp; Nanchannel Fabrication</i> 2024.	
		2nd hr.	Polymer Microfabrication	1. Book Chapter: Saliterman S., <i>"Soft" Fabrication Techniques</i> , Ch 3. 2. Aleandra-Franc, MF. <i>Fab for Enhanced Microfluidic Applications</i> 2024.	
3	2/6/2025	1st hr.	Microfluidics Part 1- Design & Fabrication	1. Book Chapter: Saliterman, S., <i>Microfluidic Principles</i> , Ch 5. 2. Scott, S. <i>Fabrication Methods Microfluidic Devices</i> 2021. 3. Su, RT. <i>3D Printed Microfluidics</i> 2024	
		2nd hr.	Microfluidics Part 2 - Basic Fluid Mechanics	1. Ferreira, M. <i>Microfluidic Systems and Numeric Moderling</i> 2024. 2. Musharaaf, HN <i>Computational Fluid Structure</i> 2024.	
4	2/13/2025	1st hr.	Lab-on-a-Chip Part 1 - Cell & Molecule Manipulation	1. Wang, X. <i>Microfluidics for Infectious Disease</i> 2022. 2. Zou, D. <i>Advances in Isolation &amp; Detection of Circulating Tumor Cells</i> 2018.	
		2nd hr.	Lab-on-a-Chip Part 2 - Detection Methods	1. Book: Barderas, R. <i>Protein Microarrays for Disease Analysis</i> 2021.	
5	2/20/2025	1st hr	Biosensors	1. Altug, H. <i>Advances &amp; Applications of Nanophotonic Biosensors</i> 2022. 2. Book: Lacaze, PC. <i>Nanotechnologies &amp; Nanomaterials Applied to Chemical &amp; Biosensors</i> 2024.	Intro by TA & help forming groups
		2nd hr	Organ-on-a-Chip (OOC)	1. Ingber, DE. <i>OOC</i> 2022. 2. Cao, UMN. <i>Microfluidic OOC Biomaterial Choice &amp; Fab.</i> 2023. 3. Dasgupta, .I <i>Microfluidic OOC for Tissue and Vascular</i> 2024.	
6	2/27/2025		Jeopardy! Be prepared - review everything!		
7	3/6/2025	3:35 - 5:00 pm	Midterm Examination - 3:35 to 4:50 pm (75 mins.) in our usual classroom. Closed book - no electronic devices permitted in room. DRC exam times must partially overlap.		
8	Spring Break	3/10-3/14			
9	3/20/2025	1st hr	Nanotransducers - Quantum Dots & Nanoparticles	1. Wongkaew, N. <i>Functional Nanomaterials &amp; Nanostructures</i> 2019. 2. Book: Sheikh, F. <i>Nanotechnology in Biomedical Sciences</i> , 3. Book: Visakh, PM. <i>Nanomaterials and Nanotechnology in Medicine</i> , 2022.	Project title & abstract due.
		2nd hr	Microsensors - MEMS	1. Book: Yellampalli, S. <i>MEMS Sensors : Design and Application</i> 2018.	Team Time.
10	3/27/2025	1st hr	Micro- & Nanorobotics Part 1 - Design & Fabrication	1. Zhang, YL. <i>Micro- &amp; Naorobotics for Medical Diagnosis</i> 2022. 2. Zhao, S. <i>Actuation &amp; Biomed. Development of Micro- &amp; Nanorobots</i> 2022. 3. Li, JX. <i>Biodegradable Microbots</i> 2023. 4. Hu, N. <i>3D Printed Micro-Nanorobots for Targeted Therapeutics</i> 2023. 5. Zheng, LZ. <i>Micro- &amp; Nanoscale Robotics for Chemical &amp; Bio. Sensing</i> 2023.	
		2nd hr	Micro- & Nanorobotics Part 2 - Janus Nanoparticles	1. Zhang, J. <i>Janus Particle Synthesis, Assembly and Application</i> 2017. 2. Zhang, X. <i>Janus Nanoparticles: From Fabrication to (Bio) Applications</i> 2021. 3. Su, HY. <i>Janus Micro- &amp; Nanorobots</i> 2023.	
11	4/3/2025	1st hr	Drug Delivery	1. Mohd, G. <i>MEMS actuators for biomedical applications</i> 2020. 2. Ma, ZC. <i>Microfluidic Approaches for Microactuators</i> 2023. 3. Hussanzadeh, P <i>Technical &amp; Engin. Therapeutics Delivery</i> 2023. 4. Book: Kaushik, A. <i>Nanostructures for Therap. &amp; Biomed. Applications</i> 2023.	
		2nd hr	Biocompatibility, FDA, ISO 10993	1. ISO 10993-1 <i>Biological Evaluation of Medical Devices</i> . 2. Bernard, M. <i>Biocompatibility of Polymer-Based Materials</i> 2018.	
12	4/10/2025		Student Presentations		Projects Due
13	4/17/2025				
14	4/24/2025				
15	5/1/2025				
	5/6-7 Study days				
16	5/13/2025	8-9 am	Standard Exam Schedule (50 mins.) in our usual classroom. Closed book - no electronic devices permitted in room. DRC exam times must partially overlap.		
	Self-Review		DNA & Protein Analysis (Lecture Slides Posted)	1. Babaei, K. <i>Proteomic Techniques</i> 2024. 2. Monter-Calle, A. <i>Protein Microarrays</i> 2021.	
	Self-Review		Clinical Laboratory Medicine (Lecture Slides Posted)	1. Book Chapter: Saliterman S. , <i>Clinical Laboratory Medicine</i> , Ch 8.	