



**FLORIDA INTERNATIONAL UNIVERSITY**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

**EEE 4421C Intro to Nanofab**

**FALL 2022**

**Instructor** : Dr. Nezih Pala  
**Lab Manager** : Patrick Roman  
**Office Hours** : Wednesday & Thursday 1:00pm – 2:00 pm  
By appointment  
**Offices** : **N. Pala:** EC 3142, **P. Roman:** EC 3441  
**Phone** : **N. Pala:** 305.348.3016, **P. Roman:** 202.294.8602  
**Sec. Phone** : 305.348.2807  
**Email** : [npala@fiu.edu](mailto:npala@fiu.edu), [proma016@fiu.edu](mailto:proma016@fiu.edu)  
**Classroom/Time:** U01 : Wednesday – EC 2710 11:00am- 12:15 pm  
**Web Page** : <https://insyst.fiu.edu/>  
Class notes are available on FIU CANVAS: <https://canvas.fiu.edu/>

**Catalog Description:**

This course will give the students an introduction to micro/nanofabrication tools and techniques. It includes lab sessions where the students design, fabricate and test selected micro-scale devices.

**Textbook** : “*Introduction to Microfabrication*” 2nd Ed., Sami Franssila ISBN-10: 0470749830, ISBN-13: 978-0470749838

**Course Objectives:**

The purpose of this course is to

1. To give the students an understanding of the standard micro and nanofabrication techniques and the issues surrounding them.
2. To give the students an overview of the major classes, components and applications of nanosystems and the fundamental principles behind the operation of these systems.
3. To apply the knowledge of nanofabrication techniques for designing a micro system.

**ABET Relationship of course to program outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.



**FLORIDA INTERNATIONAL UNIVERSITY**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

Grading Scale		FIU Code of Academic Integrity <a href="http://academic.fiu.edu/academic_misconduct.html">http://academic.fiu.edu/academic_misconduct.html</a>
A	95.1 - 100	"Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook."
A-	91.1 - 95	
B+	87.1 - 91	
B	83.1 - 87	
B-	79.1 - 83	
C+	75.1 - 79	
C	70.1 - 75	
D	50.1 - 70	
F	< 50	

**Department Regulations Concerning Incomplete Grades**

*To qualify for an Incomplete, a student:*

1. Must contact (e.g., phone, email, etc.) the instructor or secretary before or during missed portion of class
2. Must be passing the course prior to that part of the course that is not completed
3. Must make up the incomplete work through the instructor of the course
4. Must see the Instructor. All missed work must be finished before last two weeks of the following term.

**University policies:** on sexual harassment, and religious holidays, and information on services for students with disabilities

<http://academic.fiu.edu/>

<http://drc.fiu.edu>

**Policies:**

- **Academic Misconduct:** For work submitted, it is expected that each student will submit their own original work. Any evidence of duplication, cheating or plagiarism will result at least a failing grade for the course.
- **Unexcused Absences:** Two unexcused absences are permitted during the term. More than two will result in the loss of points from your final grade. (**1 point** per absence above two, **3 points** per absence above 5).
- **Excused Absences:** Only emergency medical situations or extenuating circumstances are excused with proper documentation. After reviewing documentation you are **required to email** a description of the excuse and absence dates as a written record to **npala@fiu.edu**.
- **On Time:** As in the workplace, on time arrival and preparation are required. Two "lates" are equivalent to one absence. (Leaving class early is counted the same as tardy.)



**FLORIDA INTERNATIONAL UNIVERSITY**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

- **Deadlines:** Assignments are due at the beginning of the class period on the date specified. Assignments submitted late (within 1 week) will receive **half credit**.
- Instructor reserves right to change course materials or dates as necessary.

**Grading Scale: NOTE:** There are *no makeup exams* offered

<b>Undergrad Sections (EEE4421C, EGN4012C)</b>	
<b>Topic</b>	<b>Percentage</b>
Lab Effort	20 %
Final <i>no makeup</i>	25 %
Quizzes	15%
Homework	15 %
Final Report	25 %
<b>TOTAL</b>	<b>100%</b>

I have read and acknowledge the policies and procedures described in this Syllabus

Name \_\_\_\_\_ Date \_\_\_\_\_



**FLORIDA INTERNATIONAL UNIVERSITY**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

**Class Schedule:** Once a week, 75 minutes each session: Wednesdays and 2 ½ -hour lab once a week

Week	Date	D	Topic	Homework
<b>Week 1</b> Aug. 22 - 28	Lect #1 8/24	Wed	Introduction for the course	
	LAB #1		NO LAB - Wait for the first meeting in the class	
<b>Week 2</b> Aug. 29 - Sept. 4	Lect #2 8/31	Wed	<b>Ch 1 Introduction &amp; Pressure Sensor Overview</b>	
	LAB #2		NO LAB - Work on safety certificates	
<b>Week 3</b> Sept 5 - 11	Lect #3 9/7	Wed	<b>Ch 2 Cleanrooms</b>	
	LAB #3		Cleanroom introduction	
<b>Week 4</b> Sept. 12 - 18	Lect #4 9/14	Wed	<b>Ch 4 Layout Design &amp; Ch 5 Pattern Generation</b>	HW#1 Due
	LAB #4		Layout design & simulation	
<b>Week 5</b> Sept. 19 - 25	Lect #5 9/21	Wed	<b>Ch 6 Process Simulation &amp; Ch 7 Wafer Cleaning</b>	
	LAB #5		Mask making	
<b>Week 6</b> Sept. 26 - Oct 2	Lect #6 9/28	Wed	<b>Ch 8 Optical Lithography</b>	HW#2 Due
	LAB #6		Photolithography	
<b>Week 7</b> Oct. 3 - 9	Lect #7 10/5	Wed	<b>Ch 9 Advanced Lithography</b>	HW#3 Due
	LAB #7		Metallization (by Evaporation)	
<b>Week 8</b> Oct. 10 - 16	Lect #8 10/12	Wed	<b>Ch 10 Crystal Structures</b>	HW#4 Due
	LAB #8		Lift-off & inspection	
<b>Week 9</b> Oct. 17 - 23	Lect #9 10/19	Wed	<b>C 11 Thin-Film Materials and Processes</b>	HW#5 Due
	LAB #9		Backside lithography	
<b>Week 10</b> Oct. 24 - 30	Lect #10 10/26	Wed	<b>Ch 12 Micrometrology and Materials Characterization</b>	HW#6 Due
	LAB #10		Dry etch patterning by RIE	
<b>Week 11</b> Oct. 31 - Nov. 6	Lect #11 11/2	Wed	<b>Ch 13 Etching</b>	HW#7 Due
	LAB #11		Bulk Silicon Etch (in KOH)	
<b>Week 12</b> Nov. 7 - 13	Lect #12 11/09	Wed	<b>Ch 14 Thermal Oxidation &amp; Ch 15 Diffusion</b>	
	LAB #12		Metrology	
<b>Week 13</b> Nov. 14 - 20	Lect #13 11/16	Wed	<b>Ch 16 Ion Implantation &amp; Ch 17 CMP</b>	HW#8 Due
	LAB #13		Testing	
<b>Week 14</b> Nov. 21 - 27	Lect #14 11/23	Wed	<b>Ch 18 Yield &amp; Ch 19 CMOS Process</b>	
	LAB #14		Testing	
<b>Week 15</b> Nov. 28 - Dec. 4	Lect #15 11/30	Wed	<b>NO - CLASS Reserved for Lab &amp; Report writing</b>	
	LAB #15		Testing	
<b>Week 16</b> Dec. 5 - 11			<b>FINAL WEEK - FINAL EXAM</b> <b>December 07, 2022 9:45am - 11:45am EC 2840</b>	
<b>Week 17</b>	<b>DEC 14<sup>th</sup> LAST DAY TO SUBMIT THE GRADES</b>			