

Advanced Electronic Materials Processing

EMA 6616

Class Periods: MWF, Period 4, 10:40-11:30 am

Location: TBD

Academic Term: Fall 2025

Instructor:

Dr. Jennifer Hite

jhite@ufl.edu

(352) 273-3714

Office Hours: TBD, Rhines 152

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

NA

Course Description

This is a 3-credit undergraduate/graduate class (4614/6616). The course provides an overview of production of materials for use in high-speed solid state electronic devices. This includes understanding key processing modules like deposition, lithography, etching, implantation, annealing, and oxidation as well as the mechanisms behind these processes. Key characterization techniques to evaluate the processes and examples of current industrial processes will be covered. Although this class is co-listed, students in EMA 6616 should expect more in-depth exam questions and homework problems, as well as a different grade scale.

Course Pre-Requisites / Co-Requisites

EMA 3413 or equivalent is recommended

Course Objectives

To provide students understanding of: modern semiconductor chip fabrication processes including wafer manufacturing, wet and dry etching, lithography, film deposition, diffusion, and ion implantation; design, fabrication, and operation of basic electronic devices such as MOSFETs, bipolar transistors, and computer memory; characterization of electronic materials.

Materials and Supply Fees: None

Required Textbooks and Software: None

Recommended Materials

- Main text:
 - *Fabrication Engineering at the Micro- and Nanoscale*, S. A. Campbell, fourth edition, Oxford University Press, 2012, ISBN-10: 0199861226.
 - Note: This text can be rented digitally for the semester for \$65 through [RedShelf](#).
- Supplementary texts:
 - *Principles of Electronic Materials and Devices*, S. O. Kasap, third edition, McGraw-Hill, 2006, ISBN-10: 0072957913.
 - *Semiconductor Device Physics and Design*, U. K. Mishra and J. Singh, first edition, Springer, 2008, ISBN: 9781402064807
- [Nanohub.org](#) account – will be used for device simulations in the latter half of the semester

Required Computer

Recommended Computer Specifications: <https://it.ufl.edu/get-help/student-computer-recommendations/>

HWCOE Computer Requirements: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

<Note to instructor: the above requires a student to have a computer but allows for a Windows or a Mac. Add any particular or additional department or course specific requirements.>

Course Schedule (tentative)

Module		Lecture	
	Introduction	1	1 Intro/Syllabus
Materials/ Basics	Materials	2	2 Basic Electronic Materials
			3 Basic Semiconductors
			4 Wafer Development (Asynchronous)
			HOLIDAY
			5 Equipment basics
Fabrication Processes	Thin Films	3	6 Evaporation
			7 Sputter
			8 CVD, LPCVD
			9 PECVD, ALD
			10 Oxidation
	Doping/ Controlling Films	4	11 Diffusion
			12 Ion Implant
			13 Ion Implant
			14 Annealing
			15 Review
			16 Exam 1
	Etching	5	17 Etching
			18 Etching
			19 Etching
	Lithography	6	20 Lithography
			21 Lithography
			22 Guest Lecture (Asynchronous)
			23 Fab (Asynchronous)
			HOLIDAY
			24 Lithography
	Metrology	7	25 Metrology
			26 Metrology
			27 Metrology
			28 Review
			29 Exam 2
Process Integration	Contacts & Separation	8	30 Isolation & planarization
			31 Contacts, metallization
	Logic Devices	9	32 PN junctions
			33 Logic Devices
			34 Logic Devices
	Memory Devices	10	35 Memory Devices
			36 Memory Devices
	Advanced Devices	11	37 Other Devices
			38 Non-Si devices
			HOLIDAY

				HOLIDAY
				HOLIDAY
			39	Review
			40	Exam 3

Important Dates (tentative)

29 Sept Exam 1 (Period 4, Classroom)

31 Oct Exam 2 (Period 4, Classroom)

3 Dec Exam 3 (Period 4, Classroom)

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets	variable	10%
Exam 1		30%
Exam 2		30%
Exam 3		30%
		100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources

UF General Academic Policies & Resources (Honor Policy, DRC, Academic and Health Resources):

<https://go.ufl.edu/syllabuspolices>

Graduate Level Academic Policies and Regulations (Attendance and Grading policy):

<https://gradcatalog.ufl.edu/graduate/regulations/>

Homework: Homework will be given for each of the modules. The homework is to reinforce concepts and help prepare for exams. All unexcused missed homework will be accepted between 0-24 hours after the deadline for a maximum 50% credit.

Exams: Exams will be held in person during class. Other than in emergency situations and those covered under university policies, you must *notify the instructor of your scheduled absence for exams and discuss make-up options at least one week prior* to your absence; failure to do so may not allow you to make up for the missed exam.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu