

Electronic Materials Lab
EMA 4414L Section: 1H95 and 102D

Class Periods: Monday, Period 8 - 9 03:00 -4:55 pm
Monday, Period 10-11 05:10 – 07:05 pm

Location:

M | Period 8 - 9 Room: NRF
M | Period 10 - 11 Room: NRF

Academic Term: Fall 2018

Instructor:

G. Bahar Basim
gbbasim@ufl.edu
205 C PS&T Building
Office Hours: Wednesday 1:00 pm-3:00 pm [205C PS&T]

Teaching Assistant:

Please contact through the Canvas website
Ribhu Sharma
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Office Hours: TBD

Course Description

Hands-on experience for those specializing in electronic materials. Laboratory topics include characterization of optical and electronic properties of semiconductor materials, electronic devices characterization and semiconductor processing.

Course Pre-Requisites / Co-Requisites

EMA 4614

Course Objectives

- a. This course addresses the following MSE Program outcomes (note: Numbers refer to the list of MSE Program outcomes):
1. Learn lab safety rules and 5S principles to operate in the laboratory.
 2. Apply knowledge of mathematics, science and engineering principles to materials science and engineering.
 3. Design and conduct materials science and engineering experiments and analyze and interpret the data.
 4. Design a materials science and engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.
 5. Communicate technical data and design information effectively in speech and in writing to other materials engineers.
- b. This course does not assess ABET criteria

Materials and Supply Fees

Fees listed on Canvas for the course

Required Textbooks and Software

- No required textbook. All exams and projects will be based on material presented in class as well as handouts.
- A composition book is required for every student to take notes, document pre-lab and post-lab reports.

Recommended Reading

- Introduction to Microelectronic Fabrication: Volume 5 of Modular Series on Solid State Devices, Jaeger.
- Silicon VLSI Technology: Fundamentals, Practice, and Modeling, Plummer, Deal & Griffin
- Principles of electronic materials and devices (Vol. 81). Kasap.

Course Schedule

Class Date	Topic	Section start times
Aug 27	<ul style="list-style-type: none">• Lab Safety• 5S• MOS Device Background	Section 1 & 2 Together Start at 3:00 pm
Sep 3	<ul style="list-style-type: none">• Labor Day	
Sep 10	Pre-Characterization <ul style="list-style-type: none">• Hall Effect• Thickness Measurement• Profilometry Measurement	Section 1- 3:00 pm Section 2- 5:10 pm
Sep 17	<ul style="list-style-type: none">• Ion Implantation (Simulation)	Section 1 & 2 Together Start at 3:00 pm
Sep 24	<ul style="list-style-type: none">• Wet and Dry Etching	Section 1- 3:00 pm Section 2- 5:10 pm
Oct 1	<ul style="list-style-type: none">• Oxide Growth	Section 1- 3:00 pm Section 2- 5:10 pm
Oct 8	<ul style="list-style-type: none">• Sputtering	Section 1- 3:00 pm Section 2- 5:10 pm
Oct 15	<ul style="list-style-type: none">• Photolithography Part 1_ Spin, Expose, Develop	Section 1- 3:00 pm Section 2- 5:10 pm
Oct 22	<ul style="list-style-type: none">• Photolithography Part 2_Characterization	Section 1- 3:00 pm Section 2- 5:10 pm
Oct 29	<ul style="list-style-type: none">• Thermal Evaporation	Section 1- 3:00 pm Section 2- 5:10 pm
Nov 5	<ul style="list-style-type: none">• Make-up/ Rework	Section 1- 3:00 pm Section 2- 5:10 pm
Nov 12	<ul style="list-style-type: none">• Thanksgiving	
Nov 19	<ul style="list-style-type: none">• Characterization<ul style="list-style-type: none">• Characterization of contacts• Characterization of MOS device	Section 1- 3:00 pm Section 2- 5:10 pm
Nov 26	<ul style="list-style-type: none">• Clean Room Tour	Section 1 & 2 Together Start at 3:00 pm
Dec 3	<ul style="list-style-type: none">• Final Report Presentations	Section 1 & 2 Together Start at 3:00 pm

Course Website

- The course website is on the Canvas system <http://elearning.ufl.edu/>, where you can find the syllabus, lecture notes, homework problems, announcements, and your grades.
- The required lab worksheets, SOP documents will be posted on the Canvas.

Behavior in class

- Safety is first!
- No behavior that can distract the other students in class will be allowed.
- Jean-Jacques Rousseau Principle “Ones freedom ends where the others freedom starts.”
- Destructive behavior will result in your dismissal from the class.

Attendance

- Attendance is strongly suggested since significant amount of participative as well as individual and collaborative work will be performed during the class sessions and labs are not made up in this course.
- Students are expected to comply with all laboratory guidelines, protocols, and procedures.
- Students who do not comply with these requirements or who behave disorderly or disrespectfully WILL be asked to leave.
- Leaving your cell phone on, leaving early or arriving late can be VERY distracting, you should avoid it.
- All electronic devices (laptops, cell-phones, etc.) should be turned off or in silent mode.
- Students may not bring phones or devices into the clean room lab areas, unless they are in their pockets.
- Phones may not be touched while wearing gloves, students must leave the room and remove gloves before touching phones.

Exams

- There will be a pre-quiz before each lab section.
- There will be a pre and post lab report to be documented on the student’s composition book.

Make-up exams

Make up exams will be provided only with the **prior approval of the instructor.**

Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

In general, acceptable reasons for excused absence from an exam include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, and religious holidays. In all cases, you will be required to provide written documentation, and obtain prior instructor approval. You will not be excused from any exam without following the policy above, with no exceptions. Students not in attendance for the scheduled exam will receive a score of zero. **You must notify the instructor no less than 1 week of the scheduled exam of your intent and justification for missing the exam.** Make-up exams for excused absences as well as exam conflicts must occur within 1 week of the missed exam and may occur before the missed exam.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Student Notebook	100	50%
Pre-Quiz	100	10%
Post Lab Reports (10)	100	10%
Final Report and Presentation	100	20%
Device Characterization	100	10%
		100%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

A "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Syllabus Changes

I reserve the right to make changes in the syllabus as needed. Any changes will be clearly announced on canvas and in class.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual

violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.