Electronic Materials Lab

EMA 4414L   Section 14L2, 14L3, 14L4

Class Periods: Monday: lecture period 4, 10:40am-11:30am
Monday: lab periods 6-8, 12:50pm-3:50pm
lab periods 9-11, 4:05pm-7:05pm
Wednesday: lab periods 6-8, 12:50pm-3:50pm
Location: Lectures meet in BLK 0315
Labs meet in the NRF 1st floor lobby
Academic Term: Spring 2024

Instructor:
Brent P. Gila
bgila@ufl.edu
352-273-2245
Office Hours: TBD

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website
- Garrett Baucom, garrett.baucom@ufl.edu, TBD

Course Description
(1cr) 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 will be listed on Canvas for the course

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare,	Medium

	as well as global, cultural, social, environmental, and economic factors	
3.	An ability to communicate effectively with a range of audiences	High
4.	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
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	High
7.	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in 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 Materials
- Introduction to Microelectronic Fabrication: Volume 5 of Modular Series on Solid State Devices; Jaeger. ISBN: 9780201146950 (or other equivalent text)

Course Schedule
Week 1:	Jan 8	Introduction and safety
Week 2:	Jan 15	MLK Jr Holiday – no class
Week 3:	Jan 22	Device Design and process flow
Week 4:	Jan 29	Oxidation and dielectrics
Week 5:	Feb 5	Photolithography 1
Week 6:	Feb 12	Photolithography 2
Week 7:	Feb 19	Etching – wet and dry
Week 8:	Feb 26	Photolithography 3
Week 9:	Mar 4	Photolithography 4
Week 10:	Mar 11	Spring Break – no class
Week 11:	Mar 18	Doping and Ion Implantation
Week 12:	Mar 25	Metal deposition 1
Week 13:	Apr 1	Metal deposition 2
Week 14:	Apr 8	Device packaging
Week 15:	Apr 15	Device testing
Week 16:	Apr 22	Cleanroom tour

Attendance Policy, Class Expectations, and Make-Up Policy
Behavior in class
- Safety is first!
- No behavior that can distract the other students in class will be allowed.

- Destructive behavior will result in your dismissal from the class.

Attendance
- Attendance is <u>required and recorded</u>, significant amount of participative as well as individual and collaborative work will be performed during the class sessions and labs are very difficult to make 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.
- Phones may not be touched while wearing gloves, students must leave the room and remove gloves before touching phones.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Lab Reports	100 each	40%
Lab notebook	100 each	10%
Participation	100	50%
		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

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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://sccr.dso.ufl.edu/process/student-conduct-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.

Commitment to a Safe and Inclusive 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, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Program Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

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: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

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

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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 suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints: https://distance.ufl.edu/getting-help/; *https://distance.ufl.edu/state-authorization-status/#student-complaint*.