

EMA3013C

31FH-11880

8062-11881

173D-11859

Class Periods: Mondays 1:55 to 4:55 PM

Wednesdays 1:55 to 4:55 PM

Fridays 1:55 to 4:55 PM

Monday 11:45 AM - 12:35 PM

Location: Labs = Rhines Hall B06, Lectures – CSE E222

Academic Term: Spring 2025

Instructor:

Nancy Ruzycki

nruzycki@ufl.edu

352 846 2991

Office Hours: Tuesdays (1:30-2:30 PM) and Thursdays by appointment on Zoom

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Please contact through the Canvas Website
- TBD

Course Description

General undergraduate materials laboratory. (WR)

2 Credits

Attributes: Satisfies 2000 Words of Writing Requirement

Course Pre-Requisites / Co-Requisites

Prerequisite: EMA 3080C

Course Objectives

Module/Weeks	Objectives	Main Deliverable Activities	Professional Products
Writing Reflections Week 0	Understand how to make an effective and well designed professional poster. Create a professional technical report with the right information, justification and support.	Poster reflection activity Technical Report writing activity	Creation of guiding document for technical reports and memos
Scanning Electron Microscope (SEM) Week 0 - 4	Learn to be independent user of SEM	SEM background reading SEM practice on virtualscope Two SEM trainings and one Final training	

Failure Analysis Weeks 1-3	Learn the elements of a case study for failure analysis, and apply it to actual cases. Learn to differentiate the modes of failure. Learn to differentiate different models/types of failure. Learn about the Weibull statistics and apply them to failure in ceramic materials. Learn about the Brittle to Ductile transition in materials, and test materials for presence of this transition. Conduct an independent case study on a material failure, and prepare a case study paper.	Readings on Failure Analysis One page case study/ presentation Case study on Failure Paper One on One meetings to discuss findings and report in progress	Case Study Paper (250 words) Failure Analysis Report (1000) words
Electronic Materials Lab Week 4-5	Gain background knowledge for electrical and optical properties of semiconductors and compound semiconductors for use as electronic materials. Conduct experiments to determine cutoff voltage in LEDs and compare to manufacturer value, and to band gap of compound semiconductor used in the LED. Complete a technical report. Use materials screening and engineering design process to propose an LED design using a new combination of materials to produce a novel color.	Background readings Reading specifications sheets for LEDs Wiring circuit Determining Cut Off Voltage on LEDs	Technical Report (key findings) 500 words

Quantum Dot and TEM Machine Learning Laboratory Weeks 6-10	Understand how quantum materials properties differ from nano and bulk materials. Create quantum dots through a facile method using citric acid. Analyze quantum dots using XRD, Fluorescence/IR spectra and TEM Conduct an analysis of TEM image for atomic spacing Conduct a learning experience on use of Machine Learning for TEM images.	Read background papers Develop an SOP for a particular quantum dot Analyze quantum dots Run machine learning exercises in jupyter notebooks or Matlab	SOP for Quantum Dot method Technical memo on Quantum dots (500 words)
Ceramic Challenge Weeks 10-16	Gain knowledge of the structure property relationship for dielectric ceramics Conduct an experimental design for making a dielectric ceramic Understand and apply the processing steps of calcining, pressing and sintering of a ceramic dielectric pellet in order to produce a high dielectric material with a density of > 85 % o	Background reading on ceramics Design proposal including budget Creation of material Analysis of Material Final proposal presentation (Oral and written)	Oral/Written presentation of proposal Final Group presentation, Oral/Written

Materials and Supply Fees

See UF Course Schedule for fees

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
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	Medium
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	High
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

- Fundamentals of Materials Science and Engineering, an Integrated Approach.
- Callister
- 2015, 5E
- ISBN:9780471395515

Recommended Materials

None

Required Computer

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>
Students

Course Schedule

Weeks -1-3 Failure Analysis

Weeks 4-6 Electronic Materials

Weeks 6-10 Electronic Materials

Weeks 10-16 Ceramic Design Challenge

Important Dates

See canvas page for assignment due dates

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is required in the laboratory time period. There is no make-ups for missed laboratory time.

Attendance at lecture is strongly encouraged.

This statement is required:

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
Laboratory Notebooks	50 each	15%
Skills Assessment/Formative assessments	25 each	20%
Student Products	Varies	55%
Final Project		10%
		100%

Grading Policy

The following is given as an example only.

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.ua.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.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.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 Undergraduate Coordinator
- HWC OE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@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 support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://elearning.ufl.edu/>.

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>.