

Junior Materials Laboratory 1

EMA3080C All Sections

Class Periods:

M | Period 6 (12:50 PM - 1:40 PM) Lecture

M | Period 7 - 9 (1:55 PM - 4:55 PM)

T | Period 3 - 5 (9:35 AM - 12:35 PM)

W | Period 6 - 8 (12:50 PM - 3:50 PM)

F | Period 3 - 5 (9:35 AM - 12:35 PM)

Location: Lecture - Room: FLG 0280, Lab: RhinesB06

Academic Term: Fall 2019

Instructor:

Nancy Ruzycki

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Rhines 170

Office Hours: Tuesday 6th, Friday 6th Periods

Teaching Assistants:

Please contact through the Canvas website

- Stefano Barba
- Julian Long

Course Description

First part of the general undergraduate materials laboratory

Course Pre-Requisites / Co-Requisites

EMA 3010 and EMA 3800

Course Objectives

Clearly state the learning objectives of the course, and how those objectives will be accomplished (give a list of specific actions or course elements).

Materials and Supply Fees

See Canvas Site

Required Textbooks and Software

- Course notes developed by Instructor and available on Canvas Site

Recommended Materials

- Materials Science and Engineering: An Integrated Approach
- Callister
- 5E: 2015
- 978-0471395515

Professional Component (ABET):

This is a 2 credit course. It provides 2 credits towards engineering sciences..

Relation to Program Outcomes (ABET):

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

2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	Medium
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	Medium
4. An ability to communicate effectively with a range of audiences	
5. 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
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	High
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Course Schedule

Lesson number	Lab(s)/Weeks	Content/concepts	Skills/techniques	Student product
0-1	Lab Safety practices Crystal Structure Visualization	Safety practices Crystal Structure	CrystalMaker Materials Genome project	Safety form turned in Crystal Maker exercise
1-3 Additive Manufacturing	ASTM/ISO Standards Solidworks – design dogbones, FEA analysis Granta CES – Material selection 3D printed Dogbone(s) Mechanical Testing of polymer Dogbones	Using Standards to design experiments CAD drawings of objects for 3D printing Design process, materials selection 3D printing principles Furnace basics(annealing polymers) Mechanical testing	Solidworks, design, materials selection, thermal annealing of polymers, tensile testing, ASTM standards, 3D FDM printing techniques, simple furnace basics, Matlab Plotting, Analysis of tensile data, error analysis	Solidworks rendering (STL) file FEA analysis using solidworks (PDF of file) Student notebook Technical report on 3D printed polymer (3-5 pages 500-1000 words)

				Student way point assessments Student skills assessments
4-5 Structure and properties – Kinetics, processing and behavior of polymers (polymers)	<p>Polymer MW and crystallization kinetics</p> <p>Polymer characterization using Melt flow index</p> <p>Determination of an unknown polymer using DSC and Melt flow index</p> <p>Synthesis of nylon 6, 6</p> <p>Synthesis of polyurethane</p> <p>Sodium Alginate encapsulation and diffusion</p> <p>Sorting polymers based on properties</p>	<p>Polymer structure, molecular configuration, polymer properties, polymer glass transition temperature, polymer crystallinity, molecular weight and property relationship, melting, phase changes in polymers, solidification, recrystallization, birefringence, thermosets, thermoplastics, enthalpy, heat capacity, annealing, shear, softening temperatures</p>	<p>Polarized light microscope, DSC, synthesis, error analysis, Melt flow index, Avrami equation, radial growth rate of polymers, thermal properties of polymers</p>	<p>Student notebook</p> <p>Student way point assessments</p> <p>Student skills assessments</p>
5-7 Composites	<p>Types of composites, reinforcing phase, matrix phase, anisotropic material, composite factors vs properties vs mechanical performance, specific modulus, critical load, specific strength, stiffness, fracture toughness, advantages and disadvantages, balanced laminates, maximum stress criteria,</p> <p>(Weeks 5-9)</p>	<p>Tensile loading</p> <p>Disbondment</p> <p>Fracture toughness,</p> <p>three point bending,</p> <p>fiberglass wrapping and lay up</p> <p>carbon fiber skinning</p> <p>Defects as stress concentrators</p>	<p>Mechanical testing</p> <p>Grant Software for composites</p> <p>Mechanical Testing and analysis</p> <p>Matlab for analysis</p>	<p>SOP on Layup techniques,</p> <p>Technical Report on fiberglass layup and Mechanical properties (3-5 pages, 1000 words)</p> <p>Student notebook</p>

				Student way point assessments Student skills assessments Student programs
Structure, processing and properties – relationship of temperature (metals)	Relationship of temperature to grain growth metal alloys (Titanium, Aluminum, steel) for improved infrastructure applications. (Weeks 8-15)	Grain growth, grain size determination, hardness testing, solid solutions, alloys, microstructure in eutectic alloys, nucleation, grain growth, solution heat treating, strain hardening, recrystallization, recovery, cold working	Metallurgic sample preparation, optical microscopy, advanced furnace temperature profiles, tensile testing, Rockwell and Vickers testing, error analysis, design of experiments	Student professional poster (poster 500 words) Student notebook Student way point assessments Student skills assessments

Attendance Policy, Class Expectations, and Make-Up Policy

Writing Requirement. Each Topic listed above will have a student product which will be graded as a formal assessment. There will be a rubric for each product. Student products may include, but are not limited to; lab reports, posters, abstracts, research proposals, users manuals, program codes, technical letters, oral presentations.

The writing assignments/student products for this course are designed to meet the minimum requirements of the University Writing Requirement credit of **4,000 words**. To satisfy this requirement, every assignment’s word count must be fulfilled (see Table below).

Assignment	Draft Due Date	Draft Revision Due Date	Final Due Date
Technical Report (3-5 pages 1000 words)	September 6, 2019	September 10, 2019	September 16, 2019
SMART Report (500-1000 words)	September 13, 2019	September 18	September 23, 2019
Standard Operating Procedure for Fiberglass Layup (500 -1000 words)	September 27, 2019		October 3, 2019
Technical Memo on fiberglass layup	October 7, 2019	October 14, 2018	October 25, 2019

and Mechanical properties (500-1000 words)			
Student professional poster (poster 500 words)	November 18, 2019	November 25, 2019	December 2, 2019

The instructor will evaluate and provide feedback on the student’s written assignment in accordance with both the UF writing rubric and the course content rubric for that particular assignment, including, but not limited to, grammar, punctuation, usage of standard written English, clarity, coherence, and organization. Students who do not meet minimum requirements for the written assignment will have 1 week from the return of the assignment to make changes, meet the rubric requirements and hand the assignment back in for regarding. Students will receive some loss of points for the re-grade. All feedback on writing assignments will be provided prior to the last class meeting.

Resources for Writing include:

Recommended Writing Manual: Alley, Michael “The Craft of Scientific Writing”, 3rd Edition, Springer ISBN-10 0387947663

University’s Writing Studio (www.writing.ufl.edu)

Recommended style manual is: IEEE Editorial Style Manual.

http://www.ieee.org/conferences_events/conferences/publishing/style_references_manual.pdf

All written assignments must be turned in early to receive feedback on the draft version. These dates will appear on the course website and will be approximately 1 week before main assignment due date. All writing assignments will be turned in through the class web portal and will be subjected to anti-plagiarism detection. Students found to have plagiarized will be subject to university policies.

Below is the UF writing rubric which will be used to judge mechanics and flow of the written student product. Each student product will also carry a content based rubric. The student products carry two grades, one for the writing mechanics, and one for the content mechanics. Students must satisfactorily meet both rubrics for a passing assignment.

	SATISFACTORY (Y)	UNSATISFACTORY (N)
CONTENT	Papers exhibit at least some evidence of ideas that respond to the topic with complexity, critically evaluating and synthesizing sources, and provide at least an adequate discussion with basic understanding of sources.	Papers either include a central idea(s) that is unclear or off- topic or provide only minimal or inadequate discussion of ideas. Papers may also lack sufficient or appropriate sources.
ORGANIZATION AND COHERENCE	Documents and paragraphs exhibit at least some identifiable structure for topics, including a clear thesis statement but may require readers to work to follow progression of ideas.	Documents and paragraphs lack clearly identifiable organization, may lack any coherent sense of logic in associating and organizing ideas, and may also lack transitions and coherence to guide the reader.

ARGUMENT AND SUPPORT	Documents use persuasive and confident presentation of ideas, strongly supported with evidence. At the weak end of the Satisfactory range, documents may provide only generalized discussion of ideas or may provide adequate discussion but rely on weak support for arguments.	Documents make only weak generalizations, providing little or no support, as in summaries or narratives that fail to provide critical analysis.
STYLE	Documents use a writing style with word choice appropriate to the context, genre, and discipline. Sentences should display complexity and logical sentence structure. At a minimum, documents will display a less precise use of vocabulary and an uneven use of sentence structure or a writing style that occasionally veers away from word choice or tone appropriate to the context, genre, and discipline.	Documents rely on word usage that is inappropriate for the context, genre, or discipline. Sentences may be overly long or short with awkward construction. Documents may also use words incorrectly.
MECHANICS	Papers will feature correct or error-free presentation of ideas. At the weak end of the Satisfactory range, papers may contain some spelling, punctuation, or grammatical errors that remain unobtrusive so they do not muddy the paper's argument or points.	Papers contain so many mechanical or grammatical errors that they impede the reader's understanding or severely undermine the writer's credibility.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance and Expectations - Attendance is **required** since significant amount of participation, as well as individual and collaborative work will be performed during the class sessions cannot be made up without prior permission. **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.** If your cellphone rings during class it will be confiscated for the remainder of the class period. Use of smartphones, laptops, tablets or similar personal computers is not allowed unless explicitly requested by the individual student the first day of class and for note taking purposes only. No audio/video recording is allowed without express permission of lecturer.

Labs must be made up during the unit module. Once a module is closed, students will not be allowed to make up laboratory work. Make up work is only for students with a documented excuses (University travel, illness).

Make-up Exam/Work Policy – Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Evaluation of Grades

Grading: Students will be graded according to the following:

Student Daily notebooks, and pre/post tests or surveys	15%
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Student Skills assessments	10%
Student Products (papers, waypoint assignments)	65%
Final student presentation (poster judging)	10 %

Grading Policy

Grading Scale - Grades will not be curved and there is no extra credit.

Grade Earned percentiles total:

A 93; A- 88; B+ 84; B 80; B- 76; C+ 72; C 68; C- 65; D+ 62; D 59; D- 56; E 50

“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>

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.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@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: <http://www.counseling.ufl.edu/cwc>, 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://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>.