EMA3080C Fall 2018

Nancy Ruzycki

Standardized Syllabus for the College of Engineering

1. Catalog Description (2 credits) – First part of the general undergraduate materials laboratory.

2. Pre-requisites and Co-requisites: Prereq: EMA 3010, EMA 3800

3. Course Objectives - To present the fundamental concepts in materials science and engineering through hands on activities. To experimentally establish the structure, properties, and applications of metallic, ceramic, polymeric and composite materials. To generalize structure-property-performance interrelationships in materials.

4. Contribution of course to meeting the professional component. This is a 2 credit course. It provided 2 credits towards engineering sciences.

5. Relationship of course to program outcomes: This course addresses the following MSE Program outcomes (note: Numbers refer to the list of MSE Program outcomes):

1. Apply knowledge of mathematics, science and engineering principles to materials science and engineering.
2. Design and conduct materials science and engineering experiments and analyze and interpret the data.
3. 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.
4. Communicate technical data and design information effectively in speech and in writing to other materials engineers.

ABET

(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(g) an ability to communicate effectively

6. Instructor: Dr. Nancy Ruzycki
a. Office location: RHN 170
b. Telephone: 352.846.2991
c. E-mail address: nruzycki@mse.ufl.edu
d. Office hours: TBD, or by appointment

7. Teaching Assistant: TBD

8. Meeting Times: Monday 6th period (12:50 PM - 1:40 PM) Room:
MCCB G086 Location at https://campusmap.ufl.edu/#/index/0496

MTWF Labs M (7-9th), T (3-5th, 8-10th), W(6-8th), F(3-5th)

9. Class/laboratory schedule: lecture once a week for one hour, laboratory once a week for three hours, mandatory attendance for both lecture and class.

10. Meeting Location: **Lecture** –MCCB G086, **Class** – B06

11. Materials and Supply Fees: See listed course fee on Canvas.

12. Textbooks and Software Required: none required, recommended MATLAB, CrystalMaker

13. Recommended Reading:
W.D. Callister and D.G. Rethwisch
Materials Science and Engineering: online 5th Edition (or whichever version you have)
ISBN: 0470556730

14. Course Outline - Below is the tentative schedule of topics, activities, reading assignments, exams, and homework. See Canvas for Chapter and Unit Objectives, Learning Outcomes, assignments, and rubrics. This outline is subject to change.

There may be changes/substitutions to the laboratories listed below, depending upon available equipment, and student progress.

Students are expected to dress properly for laboratory class. Closed toed shoes are required for class. Pants are preferred. There is no food or drink of any kind in the laboratory Attendance is mandatory. This is a 4000 word class with required writing pieces. See the deadlines below.

Lesson number	Lab(s)/Weeks	Content/concepts	Skills/techniques	Student product
0-1	Lab Safety practices ASTM/ISO Standards Solidworks – tensile dogbones, FEA analysis Granta CES – Material selction 3D printed Dogbone(s) Mechanical Testing of polymer Dogbones **(Week 1-2)**	Safety practices Using Standards to design experiments CAD drawings of objects for 3D printing Design process, materials selection 3D printing principles Furnace basics	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, FEA analysis. Student notebook Technical report on 3D printed polymer (3-5 pages 500-1000 words) Student way point assessments Student skills assessments
3-4 Structure and properties – Kinetics, processing and	Thermal properties of 3D printed polymers Polymer MW and crystallization kinetics Polymer characterization using DSC/TGA	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,	Polarized light microscope, DSC, synthesis, error analysis, Melt flow index, Avarmi equation, radial growth rate of polymers, thermal	Technical memo (3-5 pages 1000 words) Student notebook

behavior of polymers (polymers)	Polymer characterization using Melt flow index Determination of an unknown polymer using DSC and Melt flow index **(Weeks 3-14)**	enthalpy, heat capacity, annealing, shear, softening temperatures	properties of polymers	Student way point assessments Student skills assessments
5-9 Structure and properties - Heat, transformations and phase diagrams (metals, ceramics)	Arduino Programming to measure diffusivity and conductivity of materials using TMPs Use of thermal imaging data to visualize heat flow through a bar quantitively. Labview programming to acquire temperature data from thermocouples ASTM calibration of thermocouples Phase diagram from phase transformation lab for lead free solders Phase diagram from Free Energy – using Thermocalc to match experimental data to Theory **(Weeks 5-9)**	Work, heat energy and internal energy Standard enthalpy changes, Dispersal of Energy, entropy, Third Law, Gibbs and Helmholtz energies Standard molar Gibbs free energies, Combined 1st and 2nd Laws, Properties of Gibbs Free energy, Phase diagrams, phase boundaries, phase rule, Phase boundaries, partial molar quantities, thermodynamics of mixing, kinetics of phase transformations, chemical Potentials, phase diagrams	ASTM standards, temperature measurement, Phase diagram construction, MATLAB programming, error analysis	IEEE Report (10-20 pages, 2-3000 words) Student notebook Student way point assessments Student skills assessments Student programs
4 Structure, processing and properties – relationship of temperature (metals)	Relationship of temperature to grain growth metal alloys (Titanium, Aluminum, steel) for improved infrastructure applications. **(Weeks 10-15)**	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

15. **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, 500-1000 words)	September 4, 2018	September 10, 2018	**September 17, 2018**
Technical memo (3-5 pages 1000 words)	September 12, 2018	September 19, 2016	**September 25, 2018**
IEEE Report (8-15 pages, 2-3000 words)	October 9, 2018	October 16, 2018	**October 23, 2018**
Student professional poster (poster 500 words)	November 19, 2018	November 26, 2018	**December 3, 2018**

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.

16. 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.

17. Grading: Students will be graded according to the following:

Student Daily notebooks, and pre/post tests or surveys	15%
Student Skills assessments	10%
Student Products (papers, waypoint assignments)	70%
Final student presentation(poster judging)	10 %

18. 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. For more information on grades and grading policies, please visit:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

19. 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.

20. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

21. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

22. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
· UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
· Career Resource Center, Reitz Union, 392-1601, career and job search services.

23. Software Use – All faculty, staff and student 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 higher standard.

24. Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. 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.

25. Diversity Statement- Diversity and Inclusion: This course supports diversity and inclusion for all students .Effective engineering practice relies on the ability to recognize and embrace diversity in all its forms, including viewpoints.