Physical Metallurgy I

EMA 4120
Class Periods: MWF, Period 5, 11:45a to 12:35p
Location: WEIL0234
Academic Term: Fall 2023

Instructor:
Victoria Miller (she/her)
victoria.miller@ufl.edu
(352) 846-3373
Office Hours: TBD based on poll of class

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Nathan Fripp
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Course Description
In-depth discussion of fundamentals of physical metallurgy and principles of microstructure evolution. 3 credit hours.

Course Pre-Requisites / Co-Requisites
EMA 3050 or instructor permission.

Course Objectives
a) to familiarize the student with those terms, concepts, and definitions (i.e. jargon) used to describe the properties and processes of common engineering metals.
b) to reacquaint the student with those fundamental principles of chemistry and physics which predetermine and control behavior of metals in response to external forces, whether mechanical, physical (electrical, magnetic, optical, thermal) or chemical in nature.
c) to develop a fundamental understanding of the relationships between material composition, structure, and properties resulting from synthesis, processing or service.
d) to develop an understanding of the testing procedures used to characterize some of the more common physical properties for engineering metals, and how these properties should be used when specifying conditions where optimum performance without failure can be expected.
e) to develop an understanding of the atomistic and defect structures, and how they result in the microstructure and influence the properties of metals.
f) to develop an understanding of the processes occurring in metals during heating that influence the microstructure and properties.
g) to develop an understanding of the effects of alloying of metals upon the microstructure and properties.

Materials and Supply Fees
n/a

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	Low
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High

3. An ability to communicate effectively with a range of audiences	Medium
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	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Required Textbooks and Software

No textbooks are required for this course. Course content will be captured in posted notes and videos. The following books may be helpful references.

- Physical Metallurgy Principles
  - Abbaschian, Abbaschian, and Reed-Hill
  - Any edition
  - 978-8131520697
- Phase Transformations in Metals and Alloys (This is my favorite metallurgy textbook.)
  - Porter and Easterling
  - Any edition
  - 978-1420062106

Course Schedule

Course schedule is subject to change, but will be kept up to date on Canvas.

Week 1-2: Remedial metallurgy (review of material from previous classes)
Week 3: Structure and bonding, intro to matlab
Week 4: Crystal defects, intro to mtex
Week 5: Characterization techniques
Week 6: Characterization techniques
Week 7: Anisotropy and orientation
Week 8: Dislocations and plasticity
Week 9: Midterm exam
Week 10: Grain boundaries
Week 11: Annealing
Week 12: Complex phase diagrams
Week 13: Phase diagrams and microstructure
Week 14: Diffusion
Week 15: Prepare for final exam

Attendance Policy, Class Expectations, and Make-Up Policy

- Group chat/discussions

    - This term we will be using a group chat for class discussion, with the platform decided during a poll on the first day of class. Rather than emailing questions about the course content to me or the TA, please post your questions in the discussion platform.
    - Once finalized, the discussion group and instructions to join will be posted to Canvas. All questions about course content/logistics and other non-private information should be in the discussion group.
- Homework
    - Homework will be assigned approximately weekly.
    - Late homework will be accepted until the solutions are posted with 10% of the total points deducted for each day (or part thereof) late.
- Attendance and Absences
    - Attendance is not mandatory, but attending lectures or watching their recordings is the best way to get course content. A small portion grades are based on participation, which includes live participation in class and participation in the online discussion board.
    - If you are sick (with covid or mental health stuff or anything else) please let me know! I can work with you if I know, but I'm not psychic.
    - Verification of an absence may be required in extreme circumstances, e.g. missing a midterm exam with no notice. Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.
- "Quizzes"
    - Unannounced quizzes (approx. 10 minutes duration) will be given periodically in class or via Canvas. They will be primarily graded for completion, and I will go over the answers in class.
    - The lowest quiz grade will be dropped.
    - The quizzes are meant to show me what concepts the class is struggling with.
- Extra Credit
    - Students that make a useful demo that I can use in class will receive up to five extra credit points (based on demo quality) to be assigned to the lowest homework grade. "Standard" projects will receive 3 points, with additional points awarded for exceptional work and points detracted for sub-par work. In order to receive credit, student must provide a typed description of the class concept being demonstrated (minimum of a half page single spaced). Within reason, there is no maximum number of demos a student can submit. Extra credit will be accepted until the last day of classes. A maximum of one demo per week per student will be accepted.
    - Students giving helpful advice in the group chat (not just giving the answers, but actually helping) will also be awarded bonus points.
    - Additional opportunities for extra credit may be announced during lecture.
- Be Nice!
    - Incivility toward students, staff, or faculty will not be tolerated.
    - If you'd like me to call you by a different name, different pronouns, etc. just let me know!

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	**Percentage of Final Grade**
Homework	20%
Quizzes + participation	15%
Midterm Exam 1	10%
Midterm Exam 2	15%
Final Exam	20%
Project	20%
	100%

Grading Policy

Percent	Grade	Grade Points
93.0 - 100.0	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 – 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 – 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	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*.