

**Physical Metallurgy I**  
EMEA 4120 Section 3006  
**Class Periods:** T: 2&3 Periods and Th: 3 Period  
**Academic Term:** Fall 2020

**Instructor:**

G.E. Fuchs

[gfuch@mse.ufl.edu](mailto:gfuch@mse.ufl.edu)

352-846-3317

Office Hours: 116 Rhines, TBA

**Teaching Assistants:**

Please contact through the Canvas website

- TA: TBA

**Course Description**

An in-depth discussion of fundamentals of physical metallurgy and microstructure evolution. Credits: 3 hours.

**Course Pre-Requisites / Co-Requisites**

EMA 3050- Introduction to Inorganic Materials

**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**

NA

**Professional Component (ABET):**

This is a 3 credit course. It provides 3 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.	Low

2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	High
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	Medium
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.	Low
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	Low
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	Medium

\*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***

- Title: Physical Metallurgy Principles
- Author: Reza Abbaschian, Lara Abbaschian, Robert E. Reed-Hill
- Publication date and edition: 2010/1994, Fourth Edition
- ISBN number: 13: 978-0-495-43851-9; 10:0-495-43851-0

### ***Course Schedule***

Week 1: Introduction  
 Week 2: Chapter 1 – Structure of Metals  
 Week 3: Chapter 2 – Analytical Methods  
 Week 4: Chapter 3 – Crystal Binding  
 Week 5: Exam 1 and Chapter 4 – Dislocations  
 Week 6: Chapter 5 – Plastic Deformation  
 Week 7: Chapter 6 – Grain Boundaries  
 Week 8: Chapter 7 – Vacancies  
 Week 9: Chapter 8 – Annealing  
 Week 10: Chapter 9 – Solid Solutions  
 Week 11: Exam 2 and Chapter 10 – Phases  
 Week 12: Chapter 11 – Binary Phase Diagrams  
 Week 13: Chapter 12 – Substitutional Diffusion  
 Week 14: Chapter 13 – Interstitial Diffusion  
 Week 15: Exam 3  
 Finals Week: Optional Final Exam (12/15/20, 7:30am-9:30am)

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

Attendance is strongly encouraged but will not be recorded. While attendance is not mandatory, experience has shown that those who attend lectures learn more and earn higher grades in the course. Arrival on time is expected. Turn off all telephones before entering classroom. 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.

### ***Evaluation of Grades***

Assignment	Percentages without Optional Final Exam	Percentages with Optional Final Exam
Homework Sets (10)	25% Total	20%
Midterm Exams (3)	25% Each	20%
Optional Final Exam		20%
Total	100%	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 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](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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](mailto: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](mailto: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](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints**: <http://www.distance.ufl.edu/student-complaint-process>.