

**Course Syllabus**  
**EMA 4120 Physical Metallurgy I**  
**Section 3006, Fall 2013**

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

2. Pre-requisites and Co-requisites – EGM 3050 – Introduction to Inorganic Materials

3. Course Objectives –

- To familiarize the student with those terms, concepts, and definitions (i.e. jargon) used to describe the properties and processes of common engineering metals.
- 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.
- To develop a fundamental understanding of the relationships between material composition, structure, and properties resulting from synthesis, processing or service.
- 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.
- To develop an understanding of the atomistic and defect structures, and how they result in the microstructure and influence the properties of metals.
- To develop an understanding of the processes occurring in metals during heating that influence the microstructure and properties.
- To develop an understanding of the effects of alloying of metals upon the microstructure and properties.

4. Contribution of course to meeting the professional component - This is a 3-credit course.

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. Ability to apply knowledge of mathematics, science, and engineering to materials systems. (Low coverage)
4. Ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints. (High coverage)
6. Ability to identify, formulate, and solve engineering problems. (Medium coverage)
8. Ability to communicate effectively in both oral and written form.(Medium coverage)
9. Understanding of the economic impact of engineering solutions.(Low coverage)

10. Understanding of the global, societal, and environmental impact of engineering solutions.(Low coverage)
12. Knowledge of contemporary issues.(Medium coverage)
13. Ability to use the techniques, skills, and tools needed for practice as a materials engineer.(Low coverage)

6. Instructor – Michele Manuel Myers

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Web site: <https://lss.at.ufl.edu/>  
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7. Teaching Assistant – Michael Kesler

Office location: MAE 313  
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Office hours: TBD

8. Meeting Times – Monday, Wednesday, and Friday 5<sup>th</sup> Period

9. Meeting Location – MAEB 0234

10. Material and Supply Fees - None.

11. Textbooks and Software Required – *Physical Metallurgy Principles*, 4<sup>th</sup> edition by Reza Abbaschian, Lara Abbaschian, and Robert E. Reed-Hill, Cengage Learning, 2010 [ISBN 978-0-495-438519]. Supplementary reading and links to various other resources/websites are provided and updated throughout the semester.

12. Recommended Reading –

- *Thermodynamics in Materials Science*, 2<sup>nd</sup> edition by Robert DeHoff, CRC 2006 [ISBN 0849340659]
- *Phase Transformations in Metals and Alloys*, 2<sup>nd</sup> edition by D. A. Porter and K. E. Easterling, Chapman & Hall, 1992 [ISBN 978-0412450303]
- *Mechanical Behavior of Materials*, 2<sup>nd</sup> edition by Marc Andres Meyers and Krishan Kumar Chawla, Cambridge University Press, 2008 [ISBN 978-0521866750]
- *Deformation and Fracture of Engineering Materials*, 4th edition by Richard W. Hertzberg, Wiley, 1995 [ISBN 978-0471012146]
- *Mechanical Behavior of Materials*, 2nd edition by Thomas H. Courtney, McGraw-Hill, 1999 [ISBN 978-0070285941]

13. Course Outline – The following topics will possibly be discussed in the course:

1. Structure of Metals
2. Analytical Methods
3. Crystal Binding
4. Dislocations

5. Plastic Deformation
6. Grain Boundaries
7. Vacancies
8. Annealing
9. Solid Solutions
10. Phases
11. Binary Phase Diagrams
12. Substitution Diffusion
13. Interstitial Diffusion

14. Attendance and Expectations –The class is taught in an interactive lecture format, and includes discussion and practice problems. Cell phones should be turned off in class. Reading of newspapers, work on assignments for this or other classes, or other activities that are not part of the class are not allowed during class time.

15. Grading –

Exam 1: 30%

Exam 2: 30%

Exam 3: 30%

Quizzes: 10%

Proposal: S/U (Grad Students only)

Exams will be held during the regular 50 min lecture period. Lack of attendance at any exam will result in automatic failure in the course.

16. Homework and Quizzes – Weekly (more or less) homework will be assigned, but will NOT be collected. A homework problem from the previous week will be selected for a **weekly quiz**. The quizzes will be administered at the beginning of class, **at random**, the week following the homework assignment. Homework solutions will be posted after the quizzes are collected. NO make-up quizzes.

Note that the homework will be posted in pdf format, which requires the use of the Acrobat Reader. If you do not have it installed on your computer, it can be downloaded for free from <http://www.adobe.com/supportservice/custsupport/download.html>

17. Grading Scale –

Percentage	≥ 92	≥ 88	≥ 84	≥ 80	≥ 76	≥ 72	≥ 68	≥ 65	≥ 62	≥ 59	≥ 56	< 56
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

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>

18. Make-up Exam Policy – Make-up exams are given only for reasons of illness and in accordance with University of Florida regulations. No exam make-up will be given without prior approval of the instructor.

19. 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.

20. 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.

21. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

22. 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 highest standards of honesty and integrity.

## UNIVERSITY OF FLORIDA Student Honor Code (Abridged)

*Preamble:* In adopting this Honor Code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the University community. Students who enroll at the University commit to holding themselves and their peers to the high standard of honor required by the Honor Code. Any individual who becomes aware of a violation of the Honor Code is bound by honor to take corrective action. Student and faculty support are crucial to the success of the Honor Code. The quality of a University of Florida education is dependent upon the community acceptance and enforcement of the Honor Code.

*The Honor Pledge:* We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty 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."

Violations of the Student Honor Code include (in part):

(a) **Plagiarism**, in the form of quoting oral or written materials including but not limited to those found on the internet, whether published or unpublished, without proper attribution; or submitting a document or assignment which in whole or in part is identical or substantially identical to a document or assignment not authored by the student.

(b) **Unauthorized Use of Materials or Resources ("Cheating")**. A student shall not use unauthorized materials or resources in an academic activity. Unauthorized materials or resources shall include:

1. Any paper or project authored by the student and presented by the student for the satisfaction of any academic requirement if the student previously submitted substantially the same paper or project to satisfy an academic requirement.
2. Any materials or resources prepared by another student and used without the other student's express consent or without proper attribution to the other student.
3. Any materials or resources that the faculty member has prohibited.
4. Use of a cheat sheet when not authorized to do so or use of any other resources or materials during an examination, quiz, or other academic activity without the express permission.

(c) **Prohibited Collaboration or Consultation**. A student shall not collaborate or consult with another person on any academic activity unless the student has the express authorization.

1. Prohibited collaboration or consultation shall include but is not limited to:

- Collaborating when not authorized to do so on an examination, take-home test, writing project, assignment, or course work.
- Collaborating or consulting in any other academic or co-curricular activity after receiving notice that such conduct is prohibited.
- Looking at another student's examination or quiz during the time an examination or quiz is given. Communication by any means during that time, including but not limited to communication through text messaging, telephone, e-mail, other writing or verbally, is prohibited unless expressly authorized.

2. It is the responsibility of the student to seek clarification on whether or not use of materials or collaboration or consultation with another person is authorized prior to engaging in any act of such use, collaboration or consultation.

*This abridged version of the Student Honor Code is offered to highlight common situations. UF students are bound by all details of the entire code found at <http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>.*