ASEN 1022 – Spring 2019

Materials Science for Aerospace Engineers

Instructors: Prof. Mahmoud Hussein
Office: ECAE 194
Phone: (303) 492-3177
Email: mih@colorado.edu
Office Hours: Wednesday/Friday 4:00 – 5:00 pm (during weeks of instruction)
Location: ECAE 124 (Aero Graduate Breakout Room)

Dr. Jelliffe Jackson
Office: ECOT 612
Phone: (303) 492-3702
Email: jelliffe.jackson@colorado.edu
Office Hours: Wednesday/Friday 9:00 – 10:00 am (during weeks of instruction)
Location: ECAE 124 (Aero Graduate Breakout Room)

Laboratory Coordinator: Trudy Schwartz
Office: ECAE 1B24
Phone: 303-735-2986
e-mail: trudy.schwartz@colorado.edu

Teaching Assistants: Neil Banerjee
Office Hours: Tuesday/Thursday 12:00 – 1:30 pm
Location: ECAE 124 (Aero Graduate Breakout Room)
e-mail: Neil.Banerjee@Colorado.EDU

Mykale-Jamal Holland
Office Hours: Wednesday/Friday 11:00 – 12:30 pm
Location: ECAE 124 (Aero Graduate Breakout Room)
e-mail: Mykalejamal.Holland@Colorado.EDU

Armin Kianfar
Office Hours: Tuesday/Thursday 2:00 – 3:30 pm
Location: ECAE 124 (Aero Graduate Breakout Room)
e-mail: Armin.Kianfar@Colorado.EDU

Chia-Nien (Jonas) Tsai
Office Hours: Tuesday/Thursday 3:30 – 5:00 pm
Location: ECAE 124 (Aero Graduate Breakout Room)
e-mail: Chianien.Tsai@Colorado.EDU

Course Assistants: Zhuoying Chen (zhch1699@colorado.edu)
Benjamin Elsaesser (Benjamin.Elsaesser@Colorado.EDU)

Lectures: M/W/F: 2:00 – 2:50 pm, MATH 100

Class Web Site: log on to https://canvas.colorado.edu/ to find ASEN 1022-001

Class e-mail list: This is automatically done through Canvas.

Texts: J.F. Schackelford, *Introduction to Material Science for Engineers*, 8th edition. Pearson.

Prerequisites: APPM 1350 or MATH 1300 (minimum grade C). Required co-requisite courses: COEN 1300 or ECEN 1310 or CSCI 1300 or CSCI 1310 or CSCI 1320.

Course Objectives: Introduce the fundamental understanding of the relation between composition, structure, processing, and properties of materials. Topics include atomic bonding, perfect and imperfect crystal structures, thermal and mechanical behavior of materials, and failure mechanisms, and heat treatment. This course will provide insight into the design and selection of materials for aerospace applications.

Major Course Topics:

1. Atomic bonding.
2. Perfect and imperfect crystalline structures.
3. Diffusion.
4. Mechanical and thermal behavior.
5. Failure mechanisms.
6. Phase diagrams.
7. Heat treatment.
8. Material processing techniques.
9. Design and selection of materials.

Tentative Schedule for Coverage of Topics:

Week		Topic (Chapter in *Introduction to Material Science for Engineers)*
1		Introduction, Atomic Bonding (Chapter 2)
2		Atomic Bonding (Chapter 2)
3		Crystalline Structure (Chapter 3)
4		Crystal Defects (Chapter 4)
5		Crystal Defects (Chapter 4), Recitation, Exam 1
6		Diffusion (Chapter 5)
7		Mechanical Behavior (Chapter 6)
8		Mechanical Behavior (Chapter 6)
9		Mechanical Behavior (Chapter 6), Recitation, Exam 2
10		Mechanical Behavior (Chapter 6)
11		Spring Break
12		Thermal Behavior (Chapter 7), Failure Analysis (Chapter 8)
13		Phase Diagrams (Chapter 9)
14		Phase Diagrams (Chapter 9), Recitation, Exam 3
15		Heat Treatment (Chapter 10), Composites (Chapter 12)
16		Composites (Chapter 12), Recitation
17		Final (Date TBD)

Grading Guideline:

Group work:	Lab*	10%
	Homework*	15%
Individual:	Clicker Quizzes	10%
	3 Midterm Exams	40% (=10 % + 15% + 15%)
	Final Exam	25%
		100%

- ***Group work only counts toward final grade if the total individual grade is C or better. If the individual grade is below C, the final grade equals the total individual grade.**
- **No exam grades will be dropped.**
- **Please verify all your scores and grades on Canvas within 2 weeks after they are posted; requests to change a score need to be made within this period.**

Note: We reserve the right to make minor changes to this distribution of weights based on variations in assignments.

Exam Times and Locations:

1. Midterm 1: 2/15, class time, in class
2. Midterm 2: 3/15, class time, in class
3. Midterm 3: 4/19, class time, in class
4. Final exam: 5/4, 4:30-7:00 pm, in class

Evaluated Outcomes: The Department of Aerospace Engineering Sciences has adopted a policy of assigning grades according to evaluated outcomes (Ox) in each course. Each assignment is designed and graded to assess some combination of several or a few of the following outcomes:

O1 Professional context and expectations (ethics, economics, etc.)
O2 Historical perspective and vision
O3 Multidisciplinary, system perspective
O4 Written, oral, graphical communication ability
O5 Knowledge of key scientific/engineering concepts
O6 Ability to define and conduct experiments, use instrumentation
O7 Ability to learn independently, find information
O8 Ability to work in teams
O9 Ability to design systems
O10 Ability to formulate and solve problems

Important Notes and some Q&A:

1. We will commit to replying to email questions only in business hours, i.e. Monday through Friday, 9:00 am–5:00 pm. In general, we encourage you to ask questions at the Office Hours of the Instructors and the TAs. It is more effective for us to answer your technical questions when we are meeting in person where we can use the board or a piece of paper to make clarification. Emails received 24 hours or less before the exams are not guaranteed to be responded to.
2. We reserve the right to make changes to the weekly course schedule based on occurring events that require different dispositions. We will give sufficient advance notice through announcements in class and posting on Canvas. Changes to this syllabus and assignments may be announced at any time during class periods. We will post the current syllabus and assignments on Canvas. Both are dated in the footnote.
3. We will exclusively use Canvas to send out announcements, to provide comments to you daily on class activities, and to provide general information about course assignments. It is strongly recommended that you setup your Canvas account such that you receive automatically a notification about new postings and updates to the Canvas course page.
4. Attendance to all lectures and laboratory workshops is expected. We will give short popup quizzes during regular lectures, using Clickers. These quizzes cannot be made up if missed.
5. Why have reading assignments, homework, lab exercises, and exams?
    - Reading assignments are to be completed before the lecture/discussion. The lecture/discussions should help to clarify and supplement what you have read.
    - Homework assignments are to lead you through important applications of current material. Homework enforces the mental processes that help you to become proficient in a subject.

Before beginning any homework assignment, you should read the text and work the examples in the text. Homework, which is graded in the category "groupwork" may be discussed with the TAs/CAs.

- The experimental lab will help you to learn how to synthesize the basic concepts, methods, and tools presented in the course curriculum. The team-oriented approach will give you experience in working and cooperating in groups. Group members must inform the TAs early on when one student does not cooperate. A portion of the total lab grade will be from anonymous peer evaluation of the team members.

6. Homework:

   - Collaboration is permitted on homework. However, we strongly recommend to first work on your own on the homework before comparing your results with your homework team members. Teams of **three to four students** are permitted. Groups may change during the first two homeworks; after that the teams should be set. You may discuss the means and methods for formulating and solving problems and even compare answers, but you are not free to copy someone's assignment. **Copying material from any resource (including solutions manuals) and submitting it as one's own is considered plagiarism and is an Honor Code violation. Remember, the less you think about the problems yourself, the less you actually learn, and the more difficult it will be to succeed on exams.**
   - Homework solutions must demonstrate an understanding of the principles involved by including diagrams, using correct notation and terminology, explaining the approach, showing the key steps to obtaining the solution, and outlining the answer with proper units. These problem-solving steps are critical for developing problem formulation skills.
   - If you must miss class for an excused absence, you may submit your homework early. Late assignments are not accepted without prior instructor approval. If you know in advance that you must miss a homework due date or lab, send your instructor an e-mail or voice mail to make arrangements.
   - Although each homework assignment will have several problems, all problems may not be graded. Typically, 30-50% of the problems will be graded. However, solutions will be provided to you for all the problems.
   - All homework must be uploaded as a single PDF to Canvas by the stated deadline. The solutions should be included in the correct order, and each problem solution should be started on a new page.
   - **Only one homework per group needs to be turned in.**
   - **No late homework submissions will be accepted.**
   - Homework solutions are posted immediately after lecture.

7. Exams:

   - Request for problem re-grade in exams must be done within 2 weeks of the date on which the exam is returned. For record keeping purposes, a written explanation of the points being disputed must accompany your re-grade request.

- Acceptable excuses, such as medical certification of an emergency, are required to make up any exam. However, there is NO opportunity to make up unit quizzes. Any other medical or academic-related absences need to be communicated and approved ahead of the expected absence. **These requests must be made in email to the instructors.**

8. If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with your professor.

9. For the experimental lab in this course, we will use the testing facilities of the Integrated Teaching and Learning Laboratory (ITLL). For this course, you **do not** need to take the safety training usually needed to access ITLL facilities.
10. Food or drinks (even water) **are not** allowed on the workstations in the ITLL lab plaza.
11. Some assignments will require access to a computer and basic programming skills. Computer programming skills are a prerequisite for this class, e.g. GEEN 1300 or CSCI 1300. We **will not** teach computer programming, although we will make an effort to formulate the assignments to emphasize proper computing skills. In this class, we will exclusively use the programming language Matlab.
12. This class is not graded on a curve; there are absolute expectations of performance. A performance of 90% will earn an A, 80% earns a B, etc. However, we reserve the right to normalize the class grades based on the expected minimum level of competency. Furthermore, to receive a course grade of C or better (which is required to fulfill the prerequisite for ASEN 2001 and ASEN 2002 and other courses), students must receive a C or better in the individual coursework portion of the class

13. Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, you must let the instructors know of any such conflicts within the first two weeks of the semester so that we can work with you to make reasonable arrangements. See campus policy regarding religious observances for full details.

14. Students and faculty each have responsibility for maintaining an appropriate learning environment, not only while in class, but *also while working outside of class such as in labs and study areas.* Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester so that we may make appropriate changes to our records. For more information, see the policies on classroom behavior and the student code.

15. The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate, both in-class and outside of class, acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU-Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

16. All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible of violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at http://honorcode.colorado.edu.

Final Comments

Our grading scheme is not assigned to reward or punish. It is designed to indicate your level of competency compared to the standards set by the AES faculty. Do you meet the minimum level of competency? Do you exceed the minimum? Are you below the minimum? This should be indicated by the final grade. We (the faculty) are professionals and it is our job to set and maintain standards. We are expected to use our education, experience, and interactions with industry, government laboratories, others in academe, etc., to determine the content of these standards. Because our program is accredited by ABET (Accreditation Board for Engineering and Technology), the AES curriculum meets that board's requirements. As with any other professionals (doctors, lawyers, etc.) you must trust that we know what we are doing and that we are obliged to uphold standards.

The final grade indicates your readiness to continue to the next level of courses. Meeting the minimum requirements indicates that you are prepared to continue at least at the minimum level required for the next in the sequence of courses. Exceeding the minimum means you are ready to enter the next course and that you have mastery of material beyond the minimum, i.e., you show some level of proficiency.