

### Catalog Description

To introduce the basic principles underlying the behavior of materials. This course provides the scientific foundation for understanding of the relations among material properties, microstructure, and behavior of metals, polymers, ceramics and composites. Students will develop a vocabulary for the description of the empirical facts and theoretical ideas about the various levels of structure, from atoms, through defects in crystals, to larger scale morphology of practical engineering materials. 3 credit hours.

### Schedule

Thursday: 15:40-18:25 pm, Room Zone 3-216

### Instructor

Dr. Ali Davoodi, [ali.davoodi@scupi.cn](mailto:ali.davoodi@scupi.cn)

Office hours: Tuesday and Thursday: 2-5pm, or by appointment, Room Zone 3-319 and/or online

When sending email to the instructor, include “ENGR0022” in the subject field of your message. Use your university email account (student\_ID\_number@stu.scu.edu.cn); mail from other accounts might be stopped by the SCU spam filter. Use your real name or ID in your WeChat message, too.

### Teaching Assistants:

Kevin: [2019141520101@stu.scu.edu.cn](mailto:2019141520101@stu.scu.edu.cn)

**Textbook:** W. D. Callister Jr. and D. G. Rethwisch, Materials Science and Engineering: An Introduction, 10<sup>th</sup> Edition, John Wiley, January 2018. ISBN: 978-1-119-40549-8.

[Wiley Materials Science and Engineering: An Introduction, 10th Edition 978-1-119-72177-2.pdf](#).  
(Please note that homework is following 9<sup>th</sup> edition).

**Reference Book:** W. F. Smith and J. Hashemi, Foundations of Materials Science and Engineering, 6<sup>th</sup> Edition, McGraw-Hill Education, January 26, 2018. ISBN-10: 1259696553, ISBN-13: 978-1259696558.

**Web Site:** This course uses the Blackboard system at

[Materials Structures and Properties \(scu.edu.cn\)](http://MaterialsStructuresandProperties.scu.edu.cn)

There you will find the course syllabus, contents, homework assignments, and other materials. Please check the class page frequently.

### Class Format

**Material Structure and Properties** is taught using a combined lecture, reading, review and discussion.

**It is imperative that you come to class prepared.** This will generally involve preview textbook, lectures and tutorial videos. This is a 3-credit hour class, which means you should devote at least 6 hours of effort outside the scheduled class time every week.

Class participation counts 20% grade weight: basic 12 points for weekly attendance, plus 2 for each counted Q/A during the class (not during break or in office, not for exam questions), +2 for being a Q/A moderator, **-2 for** each unexcused absence, or missed sign in, or each time playing cellphone or video game during class.

## Homework Assignments

Homework problems will be assigned every two week or so and posted on Blackboard. These are to be turned in by the specified due time. You may work with other people on homework, but all write ups must be individual efforts.

All homework should be submitted electronically through the Blackboard system. Late homework will get zero credit.

Please adhere to these homework guidelines:

- Your assignment must be typed in Word and submitted electronically through Blackboard, with Filename format Name-ID-Hw#. Handwritten assignments (or snapshot of handwritten version) will not be accepted.
- Put your name, ID number (last four digits), and class section at the top of the first page.
- List the names of other people you've worked with on the assignment or report.

All of the homework scores will be used in your grade computation. Unless otherwise indicated, you can work with your fellow classmates in the class, but you must submit a distinct and independent write-up to receive credit.

If you are sick, or have a compelling emergency that prevents you from turning in the homework on time, inform TA.

If you believe an error has been made in the grading of an assignment, bring it to the attention of your TA within ONE WEEK of its return.

## Grading:

Total 100 points are divided into five parts - homework, mid-term, final, and class participation and seminar.

**If you are retaking**, or have 2+2/3+1 plan, TOEFL schedule, health issues or the like, please inform TA at your earliest convenience.

## Office Hours

If you do not understand something and/or want to explore more, and talking to your classmates does not help, then you should be seeking help from the instructor or teaching assistant.

Office hours are times we have specifically set aside to be available to students. During office hours, you can come to our office; you don't need an appointment. We are also available at other times; please email to schedule a time.

**Current office hours will be** Tuesday and Thursday: 2-5pm, Room 4-319 and/or online

### **Academic Integrity:**

Students in this course will be expected to comply with the SCUPI and/or University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. To foster a high level of academic integrity, the University of Pittsburgh **MEMS Department has recently established a coordinated and uniform approach** to dealing with violations of academic regulations against cheating and plagiarism.

### **Disabilities:**

If you have a disability or sickness that requires special testing accommodations or other classroom modifications, you need to notify the instructor, student counselor, and/or the [Disability Resources and Services](#) in a timely manner. You may be asked to provide documentation of your disability or sickness to determine the appropriateness of accommodations.

### **Copyright Notice**

The course materials may be protected by copyright. China and/or United States copyright law, prohibiting unauthorized duplication or retransmission. See [Library of Congress Copyright Office](#) and the [University Copyright Policy](#).

### **Statement on Classroom Recording**

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

### **Statement on Distractions during lecture and laboratory**

To ensure a foremost safe but also productive and distraction free learning environment, cellphones, smartwatches, laptops, tablets and other electronic devices are in general not allowed in the lab. **Videogames or messaging during class hour is not allowed and will have grade point deduction.** There will be exceptions from that rule after explicit permission, for example if calculations are needed.

### **Approximate Schedule via Textbook**

1. Atomic Structure and Interatomic Bonding in Solids
2. The Structure of Crystalline Solids and Noncrystalline Materials
3. Imperfections in Solids
4. Diffusion
5. Mechanical Properties of Metals
6. Dislocations and Strengthening Mechanisms in Metals
7. Failure, (Fatigue, and Creep)
8. Phase Diagrams
9. Phase Transformations
10. Applications and Processing of Metal Alloys
11. Structures and Properties of Ceramics, Applications and Processing of Ceramics
12. Polymer Structures
13. Composites
14. Corrosion and Degradation of Materials
15. Electrical Properties
16. Thermal, Magnetic and Optical Properties
17. Environmental, and Societal Issues in Materials Science and Engineering