

**Purdue University
School of Materials Engineering**

MSE 230 *Structure and Properties of Materials*

Fall 2016

Lecture: Mondays and Wednesdays at 9:30 (ARMS 1010) and 12:30 (Physics 114)

Lecturer: Prof. Rodney W. Trice, ARMS 2227, 494-6405, rtrice@purdue.edu

BoilerCasts: BoilerCasts of the 9:30 PM lecture will be available typically a few hours after class. All MSE 230 students should be able to access the MSE 230 BoilerCasts.

Office Hours: to be determined

Recitations

R13	Thur. 12:30	HAMP 2108	Alfonso Campos
R11	Thur. 3:30	ARMS 1021	Changeum Kim
R5	Thur. 3:30	HAMP 1113	Alfonso Campos
R6	Fri. 8:30	ARMS 1103	Jorge Ramirez
R4	Fri. 9:30	ARMS 1021	Reaz Chowdhury
R12	Fri. 10:30	ARMS 3115	Reaz Chowdhury
R14	Fri. 10:30	ARMS 1021	Jorge Ramirez
R8	Fri. 12:30	ARMS 1103	Changeum Kim
R3	Fri. 12:30	ARMS 3115	Sam Reeve
R10	Fri. 1:30	ARMS 3115	Sam Reeve

Textbook

Materials Science and Engineering: An Introduction, William D. Callister, Jr., **8th Edition** – yes, 8th edition.

Website

Homework problems and solutions and links to other resources will be available on Blackboard.

Examination Dates

- Exam 1: **Wednesday, Sept 28 6:30 -7:30, MTHW 210, SMTH 108, MATH 175, WTHR 172**
- Exam 2: **Thursday, November 10 6:30 – 7:30, CL50 224, MTHW 210, SMTH 118**
- Final Exam: **Tuesday, December 13, 7 – 9 PM, LAMB F101**

Course Objectives for MSE 230 can be found at:

<https://engineering.purdue.edu/MSE/Academics/Courses/MSE230/index.html>

1. To provide an introduction to Materials Science and Engineering (MSE) as the study of structure-properties-processing relationships in engineering materials (metals, polymers, ceramics, and composites).

2. To develop the general and specific relationships between the different levels of internal structure (atomic, molecular, crystal, grain, etc.) and the basic properties (physical, mechanical, thermal, electrical, etc.) of engineering materials.
3. To show how structure, and thus properties, are controlled and manipulated in the basic processing operations.
4. To apply the structure-properties-processing approach to the specification of materials for engineering applications and develop appreciation for MSE as a tool in engineering design.

Procedures

Reading the textbook is strongly recommended. This text is very clearly written and will supplement lectures. The attached schedule indicates the required readings.

Lectures will emphasize the most important points but you are also responsible for the details in the reading that time may not permit covering in lecture. Feel free to ask short questions in lecture. Consult the schedule for required readings.

Lectures will be given from an iPad which allows Prof. Trice to annotate slides during lecture. Thus, I will make available the pdf of the lectures so that students can either print them off or annotate them using their preferred method (iPad, Surface Pro, etc.) The provided slides are only “sketches” of the lectures, and you will need to add your own notes to them during class – thus, hopefully, we will avoid “death by Power Point”. *A bound copy of the notes will be available at CopyMat Services in the village, near Basil Thai, for about \$20.*

Recitations will consist of discussion led by the recitation instructor to review/supplement the reading and lecture, review of homework, and short quizzes. Any email to me regarding anything to do with a recitation or homework should be copied to your TA.

Common Question: “I have a job interview this Friday during recitation. Can I take the quiz on Monday?” Probably yes, work out the details with your TA. Show them some evidence of the interview. But, you must turn in your homework before your recitation.

Homework is available on Blackboard. Your homework solutions are due at the beginning of recitation. Late homework is not accepted without a valid excuse. Homework solutions will be posted on Blackboard before the exam.

Expected format for homework, quizzes and exams

1. Neat, legible, organized, and in sufficient detail to demonstrate that you understood and performed the calculations yourself. Draw a system schematic as appropriate. Put problems in sequential order!
2. Complete calculations in general form before substituting in numerical values.
3. Check the dimensions in any calculation and also that your answer makes physical sense.
4. Use reasonable precision in reporting the numerical value of calculations (e.g., not all 10 places of your calculator display) and use units consistently (SI unless otherwise given).

5. Use one side of paper, pen or dark pencil, adequate “white-space” for instructor comments and corrections, no spiral notebook remnants. Write your name on each page of homework and be sure to staple or clip multiple sheets.
6. Typing homework and/or using math software and computer graphing are not necessary, but not discouraged. On the other hand, the quizzes and exams require hand calculations, plotting, and sketching so you may want to practice these skills on the homework. If you do choose to submit computer-aided homework solutions, equations and variables must be clearly defined, graphs must have labeled axes with units and be reasonably scaled, and answers must be unambiguously identified. Copying the computer work of someone else is cheating (see **Advice on homework in MSE 230** below).

PARTIAL CREDIT ON ANY HOMEWORK, QUIZ OR EXAM PROBLEMS IS DISCRETIONARY AND MAY NOT BE PROVIDED AT ALL OR PARTICULARLY IF THE RESULT DOES NOT MAKE PHYSICAL SENSE. IF YOU KNOW YOUR FINAL ANSWER IS RIDICULOUS INDICATE SO GIVING YOUR REASONING. UNDER THESE CIRCUMSTANCES PARTIAL CREDIT FOR CALCULATION ERRORS MAY BE GRANTED.

Quizzes (10-minute, closed-book) will cover basic concepts from the reading, lecture, recitation, and graded homework. There will be 5 quizzes this semester. Quizzes will be given at the end of class.

Participation in recitation will not be scored, per se, but will be used in deciding borderline cases in final grading. Attendance is essential; you cannot participate unless you attend. Significant weight also will be given to how often and how well you contribute to discussion.

Examinations

All examinations are closed-book but you may use up to 1 sheet of handwritten notes (8.5” x 11”, two sides). Besides this crib sheet, the only other things allowed for the exams are writing implements, eraser, straight edge (ruler), and a calculator. *You cannot use your phone as a calculator.*

We will sit in alternate seating during exams grouped by recitation. More details before the first exam.

In case of emergency, e-mail Prof. Trice or call the School of Materials Engineering as soon as possible at (765) 494-6405. Messages are recorded 24 hours a day.

Make-up exams or quizzes will be given only for the following verifiable reasons: serious illness, family emergencies, direct conflict with another scheduled exam (must inform instructor no later than two weeks prior), or official university absence. Do not schedule travel without knowing the final exam schedule.

Grading appeals will be considered up to one week after an exam (or quiz) is returned to you. Make no additional marks on the paper. Return the entire exam or quiz along with a brief, logical explanation of the basis for your appeal written on a separate sheet of paper.

Cheating

Academic Dishonesty

Purdue University Regulations, Part 5, Section III-B-2-a describes the formal policies governing academic dishonesty. A guide providing specific examples, tips, and consequences is available from the Office of the Dean of Students at <http://www.purdue.edu/ODOS/osrr/integrity.htm>. These rules cover not only exams and quizzes, but also the graded homework. Copying or sharing any part of the homework solutions is a clear violation of university policy. Transcribing, paraphrasing or following the outline of someone else's solution(s) is cheating. The test is simple: If you write down your solution after reading or hearing someone else's solution you are cheating. Likewise, if you share or exchange your solutions with another student, in written or spoken form, you are cheating. Discussion between students of the concepts and general approach to homework problems is encouraged but the solutions you turn in for grading must be your own original work.

Advice on homework in MSE 230: The homework solutions are worth only 10% of the final grade in MSE 230, whereas the exams and quizzes count for 90% of the grade. With a 1:9 weighting in the grading, the benefits of learning from mistakes made in thinking for yourself on the homework far outweigh the risks of cheating. By copying down a correct homework solution without really learning the concepts, you are effectively trading away 9 points on an exam or quiz for 1 point on the homework. By copying an incorrect solution (a common way copying is detected) you greatly increase the risk of being caught. *We understand that discussing a solution and sharing with classmates approaches for solving homework is normal and expected. By failing to insure that you put your own originality into solutions and in particular, in written discussions to qualitative homework solutions you will penalize yourself and hinder your own learning.*

The MSE 230 teaching staff will diligently monitor academic dishonesty in exams, quizzes and homeworks. Students found to engage in academic dishonesty are subject to sanctions. For a first offense, the student will receive a zero score for the assignment, quiz or exam. Depending on the severity of the offense, the case may be referred to the Office of the Dean of Students for further action. A second offense will result in a failing grade for MSE 230 and definite referral to the Office of the Dean of Students.

Grading

Exams (25% ea)	50%
Final Exam (comprehensive)	30%
Quizzes (5)	10%
Homework (13)	10%

Final grades

The C/B division will be no higher than the median score. The B/A and D/C divisions will depend on class performance, but will be no higher than the 80th and 20th percentile, respectively. Borderline cases may be raised up (but not down) based on subjective appraisal of the student's participation.

Campus Emergency Policy

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Any such changes will be posted to the course website. If you are unable to use Blackboard from home please let us know early in the semester so we can make other

arrangements for your special needs.

THE BEST WAY TO DO WELL IN MY CLASS IS TO ATTEND ALL LECTURES.

Week	Meeting	Date	Topics	Reading From Callister 8 th Ed.	Homework Due
1	L1	Aug 22	Introduction	Chap 1	
	L2	Aug 24	Atom Attractions	Ch 2, (Ch 19 WebCT)	
	R1	Aug 25/26	Miller Indices Practice/HW1		Hmwk #1
2	L3	Aug 29	How Atoms Self-Organize - Crystals	3.1-3.12 (no hcp)	
	L4	Aug 31	Grains and X-rays	3.13-3.17	
	R2	Sep 1/2	Quiz #1/HW2		Hmwk #2
3	H	Sep 5	Labor Day Holiday		
	L5	Sep 7	Deformation of Materials	Chap 6	
	R3	Sep 8/9	Review Quiz #1		No Hmwk Due
4	L6	Sep 12	Why Materials Aren't as Strong as They...	4.5, 4.6, 7.1-7.13	
	L7	Sep 14	How to Strengthen a Metal	7.8 and paragraph before it	
	R4	Sep 15/16	Quiz #2/HW3/HW4		Hmwk #3/#4
5	L8	Sep 19	Materials with Cracks – Fracture Mechanics	Chap 8	
	L9	Sep 21	A Little Bit of Failure/Diffusion		
	R5	Sep 22/23	Review Quiz #2/HW5		Hmwk #5
6	L10	Sep 26	How Atoms Move: Diffusion	4.2, Chap 5	
	L11	Sep 28	Simple Phase Diagrams	4.3, 4.4, 9.1-9.10	
	Exam 1	Sept 28	(No Recitation) 6:30-7:30	Various Locations	HW 1-5
7	L12	Oct 3	More Complex Phase Diagrams	9.11-9.12	
	L13	Oct 5	Fe-Fe ₃ C Phase Diag./Non-Equilibrium Micro.	9.14, 9.18-9.20, Ch 10	
	R6	Oct 6/7	Review Exam/HW6		Hmwk #6
8	H	Oct 10	October Break		Oct Break
	L14	Oct 12	There is More to Steel than Pearlite	10.5-10.9, 11.7-11.8	
	R7	Oct 13-14	HW7		Hmwk #7
9	L15	Oct 17	More Non-Equilibrium Microstructures	11.3, 11.9	
	L16	Oct 19	Specialty Metals – Stainless Steel and Others	11.2	
	R8	Oct 20/21	Quiz #3/HW8		Hmwk #8
10	L17	Oct 24	Introduction to Ceramics	12.1-12.4, 12.7-12.11	
	L18	Oct 26	Processing Ceramics	13.1-13.9, 13.11	
	R9	Oct 27/28	Review Quiz #3/Quiz #4/HW9		Hmwk #9
11	L19	Oct 31	Application Modules/ Intro. to Polymers	(Not 14.8, 15.10)	
	L20	Nov 2	More Polymers	(Not 15.17-18)	
	R10	Nov 3/4	Review Quiz #4/HW10		Hmwk #10
12	L21	Nov 7	Still More Polymers	(Not 15.20-21, 15.23-24)	
	L22	Nov 9	Getting the Best of Both Materials: Composites	(Not 16.13-16.15)	
	Exam 2	Nov 10	(No Recitation) 6:30-7:30	Various Locations	HW 6-10
13	L23	Nov 14	TBD	Class Notes	
	L24	Nov 16	Thermal Properties of Materials	Chap 19 WebCT	
	R11	Nov 17/18	Review Exam/HW 11		Hmwk #11
14	L25	Nov 21	Electrical Properties of Materials	(Not 18.14, 18.18-18.23)	
	H	Nov 23	Thanksgiving Holiday		
	H	Nov 24/25	Thanksgiving Holiday		No Hmwk Due
15	L26	Nov 28	Band Structures of Materials	(Not 18.14, 18.18-18.23)	
	L27	Nov 30	Semiconductors	(Not 18.14, 18.18-18.23)	
	R12	Dec 1/2	Exam 2 Review/Quiz #5/HW12		Hmwk #12
16	L28	Dec 5	Semiconductors/TBD	(Not 18.14, 18.18-18.23)	
	L29	Dec 7	Evaluation/Review		
	R13	Dec 8/9	Evaluation of TA/Review Quiz #5/HW13		Hmwk #13
17	Final	Dec 13	Final Exam Tues, Dec 13 7-9 PM	LAMB F101	Comprehensive