OSU catalog course description:

The emphasis of this course is the microscopic physical and chemical basis for the macroscopic behavior of materials; the relationship between atomic structure, crystal structure, phase equilibria and the mechanical, thermal, and electrical properties of engineering materials.

Pre-requisites:

CH 202 or CH 222 or CH 224H or ((CH 232 or CH 232H) and (CH 262 or CH 262H or CH 272))

Course Credits:

This is a 4 credit hour course. Expect to spend anywhere from 8 to 10 hours a week doing reading, watching videos and supplemental learning resources, and doing the homework. Weeks with tests will require some additional time reviewing for the test and at most 3 hours taking the test online.

Motivation and Study Skills:

Success in this eCampus course requires motivation, discipline, and strong study skills. In-class sections face similar requirements, but the demands for discipline are greater with the on-line version. There are no video lectures similar to in-class lectures. The instructor will direct you through the extensive and professional resources provided by the textbook publisher, with additional information highlighting specific areas of difficulty, and homework assignments representative of the assessments. Very few students are successful without extensive study and extra problem practice beyond the homework assignments.

Blackboard and WileyPLUS:

This course is delivered via Blackboard and WileyPLUS. Through the course Blackboard site you will access the syllabus and learning materials, discuss issues, interact with other students and the instructor. WileyPLUS will be used for learning materials, submitting assignments, and taking exams. To preview an online course, visit Ecampus Course Demo. For technical help, see http://ecampus.oregonstate.edu/services/technical-help.htm.

Learning resources:

Callister and Rethwisch, Materials Science and Engineering: An Introduction, 9th Ed., Wiley

Note: Students must have access to the textbook and an access code for WileyPLUS, the online system provided by the publisher. There are options for a traditional hardbound textbook, loose-leaf binder version or an e-book, but be sure you have access to WileyPLUS. An access code must be purchased separately if a hardbound textbook is acquired as a standalone item. Do not attempt to use a previous edition of the text, content and problems have been changed and rearranged.

The WileyPLUS access specific to this class section is on the last page of this syllabus.

Please check with the OSU Bookstore for up-to-date textbook information for the term you enroll (http://www.osubookstore.com/ or 800-595-0357). If you purchase course materials from other sources, be very careful to obtain the correct ISBN and any on-line access codes.
Student Learning Outcomes:

By the completion of this course, students will be expected to:
1. Predict basic physical properties of materials based on a knowledge of their atomic composition and chemical bonding.
2. Readily describe the structure of crystalline materials using the nomenclature of Bravais lattices and Miller Indices.
3. Apply the principles of solid state diffusion to solve engineering problems to determine the effects of heating on composition profiles in solid solution materials in at least the 1-dimensional approximation.
4. Use a binary phase diagram to quantitatively describe the compositions, phases and microstructures developed during heat treatments of binary solid systems.
5. Use the principles of nucleation theory and solid state diffusion to solve problems involving kinetics of phase transformations in metal alloy systems.

Course content (topic coverage and overall schedule):

Week 1: Ch.1) Introduction and background of Materials Science and Engineering concepts. Ch. 2) Review of atomic structure and chemical bonding, ionic, covalent, metallic and secondary bonding.

Week 2: Ch. 3) Introduction to crystal structures and systems, unit cells, crystallographic directions and planes, Miller indices, theoretical density, atomic packing factor, close packed planes and directions.

Week 3: Ch. 4) Defects in materials, point defects, line defects, surface and planar defects, volume defects. Number of vacancy defects in relation to temperature. Solid solutions and factors governing solubility (Hume-Rothery rules).

Assessment: Midterm 1 during week 4 – Covers topics from weeks 1-3


Week 5: Ch. 9) Phase diagrams. One and two component phase diagrams. Binary isomorphous systems, 2-phase region composition, lever rule, microstructure development. Binary eutectic phase diagrams, eutectic microstructure development. Intermediate compounds, line compounds, solid-solid reactions.


Assessment: Midterm 2 during week 7 – Covers topics from Weeks 4-6


Assessment: Midterm 3 during week 9 – Covers topics from Weeks 7 and 8

Week 10: Ch. 16) Composites. Structure – Matrix and filler. Particle, fiber reinforced, laminates. Time for review before final exam.

Assessment: Final Exam – during finals week. (Comprehensive)

Evaluation of student performance:

A grade in this course is based on the following five evaluations:

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<thead>
<tr>
<th>Evaluation</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Midterm 1</td>
<td>20%</td>
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<tr>
<td>Midterm 2</td>
<td>20%</td>
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<tr>
<td>Midterm 3</td>
<td>20%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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All exams will be conducted as timed WileyPLUS sessions with follow-up electronic or paper submission of problem solving documentation for partial credit. Completion of the exams requires access to document scanning facilities within a set period of time following the online session, with deadlines specified at the time of the exam.

Exams will have two components: 1) problem solving, and 2) short answer concept questions. Problem solving in this class involves a sequence of steps and intermediate calculations that result in numerical answers. Students will work on a paper form toward the numeric answers, which will then be entered electronically in the online testing page.

This step alone does not represent completion of an exam.

Following this on-line step the paper form will be scanned by the student and submitted through email for evaluation. This will involve checking for inconsistency between the scanned paper form and the numeric answers submitted during the timed exam (reduced problem credit), and seeking evidence for correct problem solving methodology when the numerical answer is incorrect (increased problem credit).

Failure to submit the scanned paper forms will result in no exam credit.

Homework

Doing problems is essential to success in this class. Homework assignments contain the types of problems that you will be expected to solve for the midterm and final exams. Homework will be managed through the WileyPLUS online system and consist of algorithmic (individualized) problems assigned and completed within a set timeframe, typically one week. No late homework will be accepted.

Course Policies:

Exam Policies —

Exam Work: Students are expected to work on exams on their own. Exams are the way I assess what you’ve learned in the class, so I need to know that it is your own work. You are allowed to use the book and your notes for the exams however. If there is evidence of copying or collaborating on exams you will receive a zero for the exam and be reported to the Office of Student Conduct.

Makeup Exams: Preparing makeup exams requires a significant effort on the part of the instructor. Consequently, makeup exams will not routinely be given. Makeup exams will be given only for missed exams excused in advance by the instructor. For missed exams that can be anticipated ahead of exam time, advance permission from the instructor to miss the exam will be necessary. Excused absences will not be given for airline reservations, routine illness (colds, flu, stomach aches), or other common ailments. Excused absences will generally not be given after the absence has occurred, except under very unusual circumstances. Re-grades of exams will be performed when there is an error and the
student requests it. All requests for re-grading must be made within 3 class days of the day the exam is returned. After that period of time, grades will be fixed and will not be changed.

**Incompletes** — Take this course only if you plan to finish it in a timely manner (during this term). I assign an "I" or incomplete only when there is a strong and compelling case for doing so (e.g., health reasons, military commitment). I will not consider assigning an incomplete unless the individual has completed over 50% of the course tasks assessments. Please note that students receiving incompletes are subject to assignment weight reduction (and consequently may not be eligible for A or A- grades) because some of their work will be submitted late.

**Statement Regarding Students with Disabilities:**

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS) with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.

**Expectations for Student Conduct:**

Student conduct is governed by the university’s policies, as explained in the Office of Student Conduct: information and regulations.

In an academic community students, faculty, and staff each have responsibility for maintaining an appropriate learning environment, whether online or in the classroom, and have the responsibility to treat each other with understanding, dignity and respect. Disruption of teaching, administration, research, and other institutional activities is prohibited by Oregon Administrative Rule 576-015-0015 (1) and (2) and is subject to sanctions under university policies, OSU Office of Student Conduct.

Students are expected to comply with all regulations pertaining to academic honesty. In brief, academic dishonesty is defined as: An intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work. For further information, visit Avoiding Academic Dishonesty, or contact the office of Student Conduct and Mediation at 541-737-3656.

Students are expected to conduct their on-line interactions in compliance with the university's regulations regarding civility. Students will be expected to treat all others with the same respect as they would want afforded themselves. Disrespectful behavior to others (such as harassing behavior, personal insults, inappropriate language) or disruptive behaviors in the course (such as persistent and unreasonable demands for time and attention both in and out of the classroom) is unacceptable and can result in sanctions as defined by Oregon Administrative Rules Division 015 Student Conduct Regulations.

(Adapted from statements provided by Becky Warner, SOC)

**Ground Rules for Online Communication & Participation:**

- **Online threaded discussions** are public messages, and all writings in this area will be viewable by the entire class or assigned group members. If you prefer that only the instructor sees your communication, send it by email, and be sure to identify yourself and the class.
- Posting of personal contact information is discouraged (e.g. telephone numbers, address, personal website address).
- **Online Instructor Response Policy:** I will check email frequently and will respond to course-related questions within 24 hours weekdays. Weekend response may not occur.
- **Observation of "Netiquette":** All your online communications need to be composed with fairness, honesty and tact. Spelling and grammar are very important in an online course. What you put into an online course reflects on your level of professionalism. Here are a couple of references that discuss
  - writing online: [http://goto.intwg.com/](http://goto.intwg.com/)
• Please check the Announcements area and the course syllabus before you ask general course "housekeeping" questions (i.e. how do I submit assignment 3?). If you don't see your answer there, then please contact me.

(Adapted from Jean Mandernach, PSY)

OSU Student Evaluation of Teaching:

Course evaluation results are extremely important and are used to help improve this course and the learning experience of future students. Results from the multiple choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions by Ecampus. You will login to “Student Online Services” to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.
This course uses WileyPLUS

Find & Register for Your Course

- Copy and paste the correct Class Section URL listed below into your browser.
- Verify that the section matches your schedule
- Log in or click Create Account
- Accept the End User License Agreement

<table>
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<tr>
<th>Class Section Name</th>
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<tbody>
<tr>
<td>ENGR 321 E-Campus Section 400</td>
<td>To be determined</td>
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OR

- Go to www.WileyPLUS.com and click Get started
- Search our course finder for your school and class section
- Verify that the section that you choose is correct before you continue

Getting Access

Option 1: Log in and buy WileyPLUS online and save!*
   *WileyPLUS includes the complete interactive online textbook

Option 2: Buy WileyPLUS bundled with a printed textbook at your campus bookstore

“*But I was going to rent or buy a used book.*”

Used and rental books do NOT include valid WileyPLUS codes; this option is the most expensive.

Not sure which option is best for you? Grace Period gives you temporary access for up to 14 days.

Still have questions? Contact Technical Support at the URL below.

Need Help?

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LIVE CHAT! Technical Support: www.wileyplus.com/support