

# MASC 110L – Materials Science

Dr. Lessa Grunenfelder

Spring, 2020

## Lecture

MWF 11:00-11:50 am

ZHS 252

*No class 1/20, 2/17, 3/16, 3/18, 3/20, 4/3*

## Course description

MASC 110L is an introductory course intended for undergraduate engineering students. Key concepts in chemistry are discussed in the context of materials science and engineering applications. The laboratory component of the course provides students with hands-on experience, reinforcing concepts covered in lecture through direct observation and experimentation. Topics include the electronic structure of atoms, elements and the periodic table, organic and inorganic compounds, chemical reactions, kinetics and thermodynamics, and the structure and properties of engineering materials.

## Contact information

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Office hours: Friday 10:00-11:00 am, or by appointment

Office hours with TAs every week (check Blackboard)

## Course Objectives

Following completion of this course, students should be able to

- Place concepts from chemistry and materials science into a broader historical context and describe the importance of the underlying science to engineering applications
- Demonstrate familiarity with the organizational scheme of the periodic table, the electron structure of atoms, and the types and mechanisms of atomic bonding
- Differentiate between organic and inorganic compounds, and identify and name compounds
- Describe the difference, at the atomic/molecular level, between solids, liquids and gasses
- Classify engineering materials as metals, ceramics, or polymers, and describe the types of elements and atomic bonds characteristic of each material type
- Perform calculations using the ideal gas law including determining the final state of a gas given the initial state and changes in state variables, calculating partial pressure(s), and determining density
- Recognize an Arrhenius relationship, and interpret graphical information from processes that are described by an Arrhenius equation

- Use tabulated thermodynamic data to determine the spontaneity of a reaction
- Write and balance chemical equations and redox reactions
- Synthesize critical information and organize formulas, equations and concepts concisely

A Blackboard website for the course (<http://blackboard.usc.edu>) will be used for general announcements, assignments, course emails, and important course documents and information. Be sure to check Blackboard and your USC email regularly.

**Text:** Chemistry: Principles and Reactions, Masterton and Hurley, 8<sup>th</sup> edition  
ISBN: 9781305079373

A physical copy of the textbook is *not* required for the class. Purchase a hard copy only if you want one. An electronic version of the text will be available through Blackboard, and students are responsible only for material covered in lecture and discussion sections. Hard copies of the book purchased from the USC bookstore come with an OWL access code (see below) – do not misplace this code.

### **Online web-based learning (OWLv2)**

A web-based system will be used for homework assignments. Problems will be assigned after every lecture, all of which will be due prior to the following Monday lecture. Online web-based learning (OWL) assignments provide tutorials and problems based on the concepts covered in class. *Online access to the OWL system (which includes an electronic copy of the textbook) is required.* Register by clicking the “MASC 110L Spring 2020” link at the top of the Content section in the course Blackboard site. The first time you click through you will be guided through a series of prompts to register for access this semester.

*Use your USC email and the name that you are registered under at USC when signing up.*

### **Laboratory**

1:00-2:50 pm  
PCE 103

Lab sections start the week of 2/3 and end the week of 4/20. The lab is located in PCE 103. The PCE building is connected to the HED building (where my office is). PCE 103 has a sign on the door that says “MASC 110L Laboratory,” while HED 103 is a standard classroom.

Be on time for lab and wear long pants and close-toed shoes.

The lab manual is available via Blackboard. Download it and bring a copy with you to lab (either hard copy or electronic version is fine). Lab reports for each experiment are due the following week, in the lab session. Reports submitted up to one week late receive 75% credit, and those submitted up to two weeks late receive 50% credit. No credit is given for lab reports submitted more than two weeks late. *The two lowest lab report grades for the semester will be dropped.*

## Discussion

3:30-4:20 pm

Tuesday section: VPD 107

Wednesday section: ZHS 360

Discussion sessions are held weekly. In discussion students will work in groups to complete a series of guided inquiry exercises. Discussion is designed to introduce new concepts as well as further clarify concepts covered in lecture. While not all questions addressed in discussion have a single correct answer, discussion work will be graded based on participation and completeness. It is expected that students arrive prepared and engage in small group and class-wide discussions.

## Grade Breakdown

### Grading

<b>OWL Assignments</b>	10%
<b>Lab Reports</b>	15%
<b>Discussion worksheets</b>	10%
<b>Midterm 1</b>	20%
<b>Midterm 2</b>	20%
<b>Final Exam</b>	25%

## Important Dates

Midterm 1: Friday 2/21, in class

Midterm 2: Wednesday 4/1, in class

Final exam: *Wednesday 5/6, 11:00-1:00*

Exams are closed book with double-sided handwritten note sheets allowed (1 sheet for each midterm, 3 sheets for the final exam). Calculators are allowed.

## Tentative Schedule (week-by-week)

Week	Topic	Book Ch	Lab
1/13	Introduction Atoms & molecules	1 2,3	---
1/20	<i>No class 1/20</i> Electronic structure Periodic table	6	---
1/27	Atomic bonding	7	---
2/3	Organic compounds	22	Determination of Avogadro's number
2/10	Organic compounds	22	Atomic Spectroscopy
2/17	<i>No class 2/17</i> Midterm 1 (2/21)		---
2/24	Polymers	23	Reduction of copper ore to copper metal
3/7	Ideal gas law	5	Polymers

	Liquids	9	
3/9	Kinetics	11	Hardness
3/16	SPRING BREAK – no class, lab, discussion		
3/23	Equilibrium	12	Phase equilibria
3/30	Midterm 2 (4/1) No class 4/3		Crystal structures of metals
4/6	Crystals Metals, Ceramics and Polymers	9	Crystal structures of ionic solids
4/13	Thermochemistry Thermodynamics	8 16	Microstructure of metals
4/20	Electrochemistry	4,17	Corrosion
4/27	Electrochemistry	17	---

### Diversity Statement

I am committed to creating an inclusive environment in which all students are respected and valued. I will not tolerate disrespectful language or behavior based on age, ability, color/ethnicity/race, gender identity/expression, marital/parental status, military/veteran's status, national origin, political affiliation, religious/spiritual beliefs, sex, sexual orientation, socioeconomic status or other visible or non-visible differences. I expect the same from you.

You are here to learn the course content, and I am here to teach it, but we are all here to grow as people and learn from one another. It is each of our responsibility to ensure that the classroom, and the university, is a safe and inclusive environment that facilitates learning.

### Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor (or to the Coach) as early in the semester as possible. DSP is located in STU 301 and is open from 8:30 a.m. – 5:00 p.m., Monday through Friday, (213) 740-0776.

### Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others and to avoid using another's work as one's own. All students are expected to understand and abide by these principles.

Section 11.00 of *SCampus*, the USC Student Guidebook, which outlines behaviors that violate the USC Student Conduct Code, can be found here:

<https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>

A list of recommended sanctions for a range of academic integrity violations are located in Appendix A of *SCampus*, which can be found here:

[https://scampus.usc.edu/files/2009/08/appendix\\_a.pdf](https://scampus.usc.edu/files/2009/08/appendix_a.pdf)

Should there be any suspicion of academic dishonesty, students are referred to the Office of Student Judicial Affairs and Community Standards (SJACS) for further review. The SJACS review process can be found here:

[http://www.usc.edu/student-affairs/SJACS/pages/students/academic\\_integrity.html](http://www.usc.edu/student-affairs/SJACS/pages/students/academic_integrity.html)

The SJACS website provides additional resources that you will find helpful in understanding what is meant by academic integrity, such as the following:

*Academic Integrity: A Guide for Graduate Students*

<http://www.usc.edu/student-affairs/SJACS/forms/GradIntegrity.pdf>

*Academic Integrity Overview*

<http://www.usc.edu/student-affairs/SJACS/forms/AcademicIntegrityOverview.pdf>

## **Incompletes**

An incomplete (IN) is given when work is not completed because of documented illness or some other emergency occurring after 80% of the course has been completed. Arrangements for the IN and its removal should be initiated by the student and agreed to by the instructor prior to the final exam. The University policy on IN is as follows (from the USC Catalogue):

*Conditions for Removing a Grade of Incomplete:* If an IN is assigned as the student's grade, the instructor will fill out the IN Completion form which will specify to the student and to the department the work remaining to be done, the procedures for its completion, the grade in the course to date, and the weight to be assigned to work remaining to be done when computing the final grade. A student may remove the IN by completing only the work not finished as a result of illness or emergency. Previously graded work may not be repeated for credit. It is not possible to remove an IN by re-registering for the course, even within the designated time.

*Time Limit for Removal of an Incomplete:* One calendar year is allowed to remove an IN. Individual academic units may have more stringent policies regarding these time limits. If the IN is not removed within the designated time limit, the course is considered "lapsed" and the grade is changed to an IX and it will be calculated into the grade point average as 0 points. Courses offered on a Credit/No Credit basis or taken on a Pass/No Pass basis for which a mark of IN is assigned will be lapsed with a mark of NC or NP and will not be calculated into the grade point average.

## **Standards of Appropriate Online Behavior**

This course involves both in-person and online segments. The protocols defined by the USC Student Conduct Code will be upheld in online classes. Students are

not allowed to post inappropriate material, spam to the class, use offensive language, or engage in online flaming. For more information, please visit <http://www.usc.edu/student-affairs/SJACS>

### **Emergencies and Course Continuity**

In case of emergency, and if travel to campus is difficult, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of 2SC, teleconferencing, and other technologies. Although this course uses the 2SC LMS for online support, an emergency site for the course is also available through 2SC (2SC.usc.edu). For additional information about maintaining classes in an emergency, please access: <http://cst.usc.edu/emergency-preparedness/>

*In the Event of Technical Breakdowns:* Students may submit assignments to the instructor via email by the posted due date. Remember to frequently back up your work, post assignments once completed, load files onto a power drive, and keep a hard copy of papers/projects.

### **Academic Accommodations**

The University of Southern California is committed to full compliance with the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA). As part of the implementation of this law, the University will continue to provide reasonable accommodation for academically qualified candidates with disabilities so that they can participate fully in the University's educational programs and activities. Although USC is not required by law to change the "fundamental nature or essential curricular components of its programs in order to accommodate the needs of disabled candidates," the University will provide reasonable academic accommodation. It is the specific responsibility of the University administration and all faculty serving in a teaching capacity to ensure the University's compliance with this policy.

Any candidate requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. to 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776. The email address is [ability@usc.edu](mailto:ability@usc.edu). The website for DSP has additional information regarding accommodations and requests ([www.usc.edu/disability](http://www.usc.edu/disability)).