



MASC 583: Materials Selection

Units: 4

Term—Day—Time: Spring 2024, TH 10:00-11:50

Lecture: RTH 217

Instructor: Lessa Grunenfelder

Office: HED 213

Office Hours:

Thursday 12:00-1:00

Contact Info: grunenfe@usc.edu

Teaching Assistant:

Boxin Zhang (boxinzha@usc.edu)

Course Description

MASC 538 introduces the wide range of materials and processes available for engineering design and part fabrication. The focus of the course is a systematic selection methodology to narrow the available choices of material and process based on properties, performance, manufacturing considerations and economic and environmental factors. Material and process databases are introduced and utilized along with analytical strategies to aid selection.

Learning Objectives

Following completion of this course, students will be able to

- Name the material families and discuss property and processing commonalities among members of the same family
- Describe shaping, joining and finishing operations
- Utilize software (GRANTA EduPack) to locate information in material and process records, construct property charts, and determine material-process compatibility
- Given a materials design problem - evaluate the available options, apply constraints to narrow possible choices, utilize objectives to select a material and process, and justify the final selection with detailed documentation.

Recommended Preparation: Introductory materials science (MASC 310L or equivalent)

Course Notes

The Desire2Learn system (<https://courses.uscden.net/d2l/login>) will be used for all course content including general announcements, course emails, homework, lecture videos, and important course documents and information. Be sure to check Desire2Learn and your USC email regularly. All assignments will be submitted through the Desire2Learn system.

Technological Proficiency and Hardware/Software Required

A computer with internet access is required to access course materials and complete/submit assignments. The course will utilize a software package (GRANTA EduPack) for homework assignments and a semester-long selection project. The software will be available through the Viterbi virtual desktop infrastructure (VDI). For issues with the VDI contact Viterbi IT (engrhelp@usc.edu)

If you need resources to successfully participate in class, such as a laptop or internet access, there are options for you on campus including the [USC Computing Center Laptop Loaner Program](#).

For any technological difficulties or software needs please utilize the following USC Technology Support Links: [Zoom information for students](#), [Blackboard help for students](#), [Software available to USC Campus](#).

Required Readings

All course materials will be linked via Desire2Learn, there is no need to purchase a textbook. The primary text used for the course, which is available online via the USC library, is linked below:

[Materials Selection in Mechanical Design](#) (4th Edition) by Michael F Ashby

Optional Readings and Supplementary Materials

Additional course materials will be posted to the class website. For those that have not taken an undergraduate course in materials science, a good introductory materials text to add to your academic library is *Materials Science and Engineering: An Introduction* OR *Materials Science and Engineering: An Integrated Approach* by Callister and Rethwisch (any edition). Used copies are available for purchase online (I like thriftbooks.com).

Description and Assessment of Assignments

Homework

Web-based homework assignments will be posted periodically to assess familiarity with key concepts and software functionalities. Assignments will be submitted through Desire2Learn. Assignments will be posted on Thursdays and are due the following Thursday, prior to the start of class. Late assignments will be accepted up to 24 hours after the due date, with a 25% late penalty.

Selection Project

A course project will incorporate many of the key topics discussed throughout the semester. Details of the project will be covered in lecture and posted on the Desire2Learn site.

Deliverables include:

- Topic selection
- Annotated bibliography of resources
- Plot formatting
- Translation
- Final written report
- One-slide summary (for presentation and discussion)

Class will meet via Zoom the week of 4/8 for presentations

Grading Breakdown

Assessment Tool (assignments)	% of Grade
Homework	15
Midterm	20
Project	40
Final exam	25
TOTAL	100

Grading Scale

Letter grade	Corresponding numerical point range
A	92-100
A-	90-91
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	65-69
D	60-64
D-	55-59
F	54 and below

Assignment Submission Policy

All course assignments will be distributed and submitted via D2L, typically using the built in Gradescope tool. Feedback will be available through D2L/Gradescope as well. Project summary slides will be submitted as Google slides links.

Grading Timeline

Homework and exams will be graded within one week. Feedback on project deliverables will be posted within two weeks of submission.

Late Work and Extension Policy

Final project report and one-slide summary deadlines are firm. A late penalty of 10% will be applied immediately following the due date, with an additional 15% deduction every 12 hours thereafter. Throughout the semester students will be granted up to 2 one-week extensions on homework assignments or intermediate project deliverables, no questions asked. Beyond 2 extensions the late policy for the final report will apply to other assignments.

Classroom Norms

Students are welcome to take notes on a device or by hand. Students are asked not to use devices for non-course related activities during class time.

Academic Integrity

Students are welcome to discuss project assignments and homework with peers and the TA/instructor. All submitted work, however, must be the student's own. Any information taken from sources must be cited – proper citation format will be provided.

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

A Note on Use of AI

Use of artificial intelligence (AI) powered programs on assignments must be disclosed. AI tools are permitted to help you brainstorm ideas or revise work you have already written. Be aware that AI text generation tools may present incorrect information, biased responses, and incomplete analyses; thus they are not yet prepared to produce text that meets the standards of this course. To adhere to our university values, you must cite any AI-generated material (e.g., text, images, etc.) included or referenced in your work and provide the prompts used to generate the content. Using an AI tool to generate content without proper attribution is considered plagiarism.

Please note: I will not be using any AI tools in grading your work or providing feedback – all comments will be my own.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Evaluations

Course evaluation occurs at the end of the semester university-wide. The learning experience evaluation is a critical tool for instructors and the university to improve teaching. Students are asked to provide honest and constructive feedback and focus on specific aspects of instruction as opposed to personal characteristics of the instructor.

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 on the basis of 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 our online classroom space, and the university, is a safe and inclusive environment that facilitates learning.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Assignments
Week 1 1/8-1/12	Introduction: Ch 1-2 The Materials Universe: Ch 3	Assigned: D1 Project Selection Due: Nothing
Week 2 1/15-1/19	Properties and Property Charts: Ch 3-4	Assigned: HW 1 Due: Project selection
Week 3 1/22-1/26	Implementing Charts in Selection (Material Indices) Ch 5-6	Assigned: D2 Annotated bibliography Due: HW 1
Week 4 1/29-2/2	The Process Universe Ch 13 Process-Property Relationships	Assigned: HW 2 Due: D2 Annotated bibliography
Week 5: 2/5-2/9	Process-Property Relationships Cont.	Assigned: D3 Plot formatting Due: HW 2
Week 6 2/12-2/16	Process Selection Ch 13-14 Cost Models Ch 13	Assigned: HW 3 Due: D3 Plot formatting
Week 7 2/19-2/23	Midterm	Assigned: D4 Translation Due: HW 3
Week 8 2/26-3/1	Conflicting Objectives Ch 7-8	Assigned: Nothing Due: Nothing
Week 9: 3/4-3/8	Materials and Shape Ch 9 Selection Involving Shape Ch 10	Assigned: HW 4, final report Due: Translation
3/11-3/15	Spring Break	
Week 10 3/18-3/22	Eco Design Ch 15, Ch 17	Assigned: HW 5 Due: HW 4
Week 11 3/25-3/29	Durability	Assigned: Nothing Due: HW 5
Week 12 4/1-4/5	Hybrid Materials Ch 11-12	Assigned: HW 6 Due: Final Report and one slide summary
Week 13 4/8-4/12	Presentations (class meets via Zoom – see D2L for Zoom link)	Assigned: Nothing Due: HW 6
Week 14 4/15-4/19	Materials for Energy Applications	Assigned: HW 7 Due: HW 6
Week 15 4/22-4/26	Materials for Aerospace Applications	Assigned: Nothing Due: HW 7
Final Exam	Tuesday, May 7 th 11:00-1:00 PM (You can find exam dates/times for all of your courses here)	

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services

(though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.