

USCViterbi
School of Engineering

MASC 583, Materials Selection

Units: 4.0

Spring 2023, Thursday, 6:00-9:20 pm

Location: SCT 1501K

Instructor: Michael Hahn

Office: TBD

Office Hours: By Appointment

Contact Info: hahnmt@usc.edu 310-350-3035

Teaching Assistant: TBD

Office: TBD

Office Hours: TBD

Contact Info: TBD

Course Description

“Materials selection in relationship to design and fabrication, economic considerations, methodology of selection, performance parameter; case studies.”

An overview of the materials and processes universes is provided. The course considers both traditional, empirical methods of materials selection as well as a more systematic approach.

Learning Objectives

The course will provide a background on how materials are selected, focusing on structural (load-bearing) applications but also considering physical properties, cost, and environmental considerations. Both empirical and systematic methods are discussed. The systematic method is enhanced with the use of the software available in the class.

Recommended Preparation: basic knowledge of materials science and mechanics of materials.

Course Notes

Copies of the lecture slides will be posted on Desire2Learn

Technological Proficiency and Hardware/Software Required

Lectures and other course information may be accessed through Desire2Learn

Software: CES Edupack 2019 (will be made available to class)

Required Readings and Supplementary Materials

Textbook: Materials Selection in Mechanical Design, Fifth Edition, by Michael F. Ashby
Burlington, MA: Butterworth-Heinemann, 2018.

Supplemental Reading: Cellular Solids: Structure and Properties, Lorna Gibson and Michael F. Ashby,
Cambridge: Cambridge University Press, 1999. (Available in the library on 2-hour reserve)

Description and Assessment of Assignments

Homework is optional and will be corrected but not graded.

Grading Breakdown

Assignment	Points	% of Grade
Midterm 1	100	20
Midterm 2	100	20
Selection Project	100	30
Final	100	30

Assignment Submission Policy

Assignments may be handed in in person before or after class or submitted through DEN.

Additional Policies

Exams are open book, open notes. Calculators are permitted but no other electronic devices may be used.

Course Schedule: A Weekly Breakdown.

	Topics/Daily Activities	Readings and Homework	Deliverable/ Due Dates
Week 1 1/12	Introduction to Materials Selection Overview of Materials	Ashby, Chapters 1& 3	
Week 2 1/19	Overview of Processes The Design Process	Ashby, Chapter 6 Ashby, Chapter 1	
Week 3 1/26	Material Properties	Ashby, Chapter 2 & 3	
Week 4 2/2	Materials Selection Methodologies	Ashby, Chapter 4	
Week 5 2/9	Multiple Constraints Material and Shape	Ashby, Chapter 8 Ashby, Chapter 10	
Week 6 2/16	Environmental and Energy Costs Product Lifecycle Considerations	Ashby, Chapter 14	
Week 7 2/23	First Exam, 6:00-7:15	Online	
Week 8 3/2	Case Studies	Ashby, Chapter 5, 9 Ashby, Chapter 11	
Week 9 3/9	Case Studies: Processes Hybrid Materials and Composites	Ashby, Chapter 7 Ashby, Chapter 12	
Week 10 3/16	SPRING BREAK, NO CLASS		
Week 11 3/23	Hybrid Materials and Composites Case Studies: Aerospace Metals	Ashby, Chapter 13	
Week 12 3/30	Second Exam, 6:00-7:15	Online	
Week 13 4/6	Case Studies: Aerospace Metals		
Week 14 4/13	Case Studies: Aerospace Composites		
Week 15 4/20	Industrial Design Case Studies, Fibers	Ashby, Chapter 16	Materials Selection Project due 4/20
Week 16 4/27	Summary and Review		
4/29-5/2	STUDY DAYS		
FINAL 5/4	FINAL EXAM, 6-8 PM, Thursday, May 4, Room TBD		

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions>. Other forms of academic dishonesty are equally unacceptable. See additional

information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.