

# MSE 112: Materials Selection and Performance

## Spring 2019

### Class times

Lecture:

T 11:30am - 12:20pm; KL-202.

Lectures will start promptly; *you are expected to arrive on time* to hear important announcements that include the learning objectives for each lecture.

Discussion:

T 12:30pm - 1:20pm; KL-202.

Lab:

R 11:30am - 2:20pm; KL-202.

### Course goals

- Learn key concepts and methods of the quantitative treatment of materials selection for engineering applications.
- Develop a comprehensive understanding of the relationship between design parameters and materials properties rather than relying on isolated concepts from crystallography, thermodynamics or similar.
- Gain understanding on how properties are influenced by processing, and service conditions and how to integrate materials selection in engineering applications.
- Be able to communicate knowledge gained about materials selection and performance.
- Use a materials selection software: *Cambridge Engineering Selector (CES EduPack)*.

### Learning outcomes

To achieve the *course learning outcomes*, you will

- apply fundamental knowledge about materials selection and performance, as demonstrated by homework, examination, project, assignments, reports and presentations;
- use the techniques, skills and modern engineering tools necessary for engineering practice, as verified by homework, project, assignments, reports and presentations;
- gain effective communication skills and ability to function effectively on an interdisciplinary team, as demonstrated by project, reports, evaluations and presentations;

- analyze contemporary case studies to make connections and decisions based on their design and selection merit, as verified by homework, project, reports and presentations;
- gain understanding of the impact of engineering solutions in a global, economic, environmental and societal context, as verified by homework, discussions, examination, project, assignments, reports and presentations.

You will practice the related skills in homework and discussion exercises. You will demonstrate your proficiency formally in the midterm examination.

The course learning outcomes will contribute to your attainment of the following *program learning outcomes* (marked with an asterisk):

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.\*
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.\*
3. An ability to communicate effectively with a range of audiences.\*
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.\*
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.\*
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.\*

### **Lead instructor (lectures, discussion, and lab)**

**Vipawee Limsakoune (vlimsakoune@ucmerced.edu)**

Office hours:

M 2:00pm - 3:00pm; AOA-146

F 2:00pm - 3:00pm; AOA-146

*E-mail is not a substitute for attending office hours, and it is not a useful medium for obtaining help with homework.*

### **Prerequisites**

ENGR 045 Minimum Grade: C-.

Open only to major(s): Bioengineering, Materials Sci and Engineering, Environmental Engineering, Mechanical Engineering, Computer Science and Engineering or Consent of Instructor.

Open only to standing(s): Junior, Second Baccalaureate, Senior.

## **Text & Software**

- M.F. Ashby, *Materials Selection in Mechanical Design*, 4<sup>th</sup> Edition, Elsevier, 2011; ISBN 978-1-85617-663-7. The textbook can be found at the following link: [https://ucmerced.worldcat.org/title/materials-selection-in-mechanical-design/oclc/708240020&referer=brief\\_results](https://ucmerced.worldcat.org/title/materials-selection-in-mechanical-design/oclc/708240020&referer=brief_results)
- F.A.A. Crane; J.A. Charles; J. Furness, *Selection and Use of Engineering Materials*, 3<sup>rd</sup> Edition, Elsevier, 1997; ISBN 978-0-08054-090-0. The textbook can be found at the following link: [https://ucmerced.worldcat.org/title/selection-and-use-of-engineering-materials/oclc/476103576&referer=brief\\_results](https://ucmerced.worldcat.org/title/selection-and-use-of-engineering-materials/oclc/476103576&referer=brief_results)

Additional reading will be assigned.

- *Cambridge Engineering Selector (CES EduPack)*, Granta Design Limited, Cambridge, UK, 2010, [www.grantadesign.com](http://www.grantadesign.com).

## **Discussion**

Learning a subject is enhanced by *interacting with* the subject – which includes discussing concepts and solving practice problems. Your discussion section is designed to support your efforts to learn the course material by working with it in as many ways as possible. Attendance will be recorded.

## **Homework**

Homework is a critical component of this course and is designed to help you learn, understand and practice the material. Six sets of homework exercises will be issued during the semester. Homework is due on the dates indicated in the detailed schedule provided to course participants via CatCourses. ***Late homework will not be accepted without proof of medical or similarly grave extenating circumstances.***

You are encouraged to work with your peers when doing homework. However, each student must turn in his/her own homework assignment and it must reflect his/her own work. You must explicitly identify all peers with whom you worked.

## **Quiz**

Questions will be based on course materials, the reading from last lecture and the reading from present lecture.

## **Lab**

You will have the opportunities to discuss course material, homework, explore materials selection charts, practice Cambridge Engineering Selector (CES EduPack) and work on project during the lab section. Attendance will be recorded.

## **Project**

Each student will work on a project in a team using the CES EduPack software. The topic will vary and be conducted with approval of the instructor. Each student will turn in an individual report and present his/her project as a group to the class at the end of the semester.

## **Exam**

There will be one in-class midterm exam as indicated on the detailed schedule. *There will be no make-up exam.* If you are sick during a regularly scheduled exam, please bring a note from the university clinic or your own doctor verifying your illness. Your course grade will then be determined by the rest of your work.

Crib sheets will not be allowed during the exam or quizzes. However, calculators will be allowed when necessary, provided that they are not used to store data or formulae pertaining to the course.

## **Grade determination**

Your final grade will be based on the following components:

- homework (20%)
- midterm (30%)
- quizzes (20%)
- project (30%).

Note that grades will not be assigned on a curve, but will be based on an absolute measure of your work.

## **Dropping the course**

Please see the UC Merced General Catalog and the Registrar's / Student First website for details.

## **CatCourses**

The CatCourses site S19–MSE 112 01 will be used for periodic course announcements, and for distributing class notes, discussion exercises, homework sets, and (some) solutions. You can also check the scores that you have received on your homework assignments and exams.

**Warning: pay no attention to any letter grade that is reported on CatCourses, *except* for the final grade.**

### **Special accommodations**

University of California, Merced is committed to creating learning environments that are accessible to all. If you anticipate or experience physical or academic barriers based on a disability, please feel welcome to contact me privately so we can discuss options. In addition, please contact Student Accessibility Services (SAS) at (209) 228-6996 or [disabilityservices@ucmerced.edu](mailto:disabilityservices@ucmerced.edu) as soon as possible to explore reasonable accommodations. All accommodations must have prior approval from Student Accessibility Services on the basis of appropriate documentation.

If you anticipate or experience barriers due to pregnancy, temporary medical condition, or injury, please feel welcome to contact me so we can discuss options. You are encouraged to contact the Dean of Students for support and resources at (209) 228-3633 or <https://studentaffairs.ucmerced.edu/dean-students>.

We will make every effort to accommodate all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please speak with the lead instructor (VL) during the first week of class regarding any potential academic adjustments or accommodations that may arise due to religious beliefs.

### **Academic honesty and conduct**

Students are expected to complete their own work and to abide by the UC Merced Academic Honesty Policy:

[http://studentconduct.ucmerced.edu/sites/studentconduct.ucmerced.edu/files/page/documents/academic\\_honesty\\_-\\_800.pdf](http://studentconduct.ucmerced.edu/sites/studentconduct.ucmerced.edu/files/page/documents/academic_honesty_-_800.pdf) and

<http://studentlife.ucmerced.edu/files/page/documents/integrity.pdf>. Any work submitted by a student in this course for academic credit will be the student's own work.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, (for example) in the form of an email, an email attachment file, an online file in a shared folder, a diskette or external drive, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

You must do your own work during examinations. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Note that the handouts and notes provided in this course are for your *personal* use only. Re-posting such materials on sites such as (for example) “Course Hero” is an explicit violation of this agreement.

Students and instructors are expected to honor UC Merced’s Founding Principles of Community: <http://www.ucmerced.edu/about-uc-merced/principles-community>.

## **Diversity, Equity, and Inclusion**

At UC Merced, we believe that our differences — of race, ethnicity, gender, religion, sexual orientation, gender identity, age, socioeconomic status, abilities, experience, geographic region and more — enhance our ability to achieve the university’s primary mission of research, teaching and public service. We welcome students, faculty, and staff members from all backgrounds, and our goal is that everyone here feels respected and valued. That philosophy is at the core of what we do. For more information, see these campus websites: <https://www.ucmerced.edu/diversity>

## **Resources**

### **Counseling and Psychological Services**

The mission of UC Merced Counseling and Psychological Services (CAPS) is to support the mental health and well-being of our students. It is the intention of all CAPS staff to provide a safe, confidential atmosphere of acceptance and accessibility to professionals in the field of psychology.

*Contact Information (Confidential Help)*

Phone: (209) 228-4266

[counseling@ucmerced.edu](mailto:counseling@ucmerced.edu)

<https://counseling.ucmerced.edu/>

### **Discrimination & Sexual Violence Prevention**

The University of California is committed to creating and maintaining a community where all individuals who participate in university programs and activities can work and learn together in an environment free of harassment, exploitation or intimidation.

*Contact Information*

Phone: (209) 285-9510

[msalvador2@ucmerced.edu](mailto:msalvador2@ucmerced.edu), Michael Salvador, Director of Compliance

<https://dsvp.ucmerced.edu/>

### **CARE Office**

Campus Advocacy, Resources, & Education (CARE) provides prevention education for the UC Merced community to achieve an environment free from the threat of sexual violence, dating/domestic violence, and stalking. They provide free and confidential assistance for all UC Merced affiliates (including Undergraduate students, Graduate students, Staff and Faculty. Stop by KL 107.

*Contact Information (Confidential Help)*

Campus Advocate: Lynna (209) 386-2051

Valley Crisis Center: 24/7 Hotline (209) 722-4357  
<https://care.ucmerced.edu/>

### **Health Promotion**

Health Promotion department is to foster a campus community that encourages positive health behaviors supportive of UC Merced students' academic success and well-being during their collegiate experience.

*Contact Information*

Phone: 209-228-4187

<https://healthpromotion.ucmerced.edu/connect-us/office-hours-location>

### **Emergency food, housing, and other basic assistance**

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to *contact* Associate vice Chancellor and Dean of Students, Dr. Jonathan Grady (KL 113).

*Contact Information*

Phone: 209-228- 3633

[jgrady2@ucmerced.edu](mailto:jgrady2@ucmerced.edu)

Emergency food, housing, and other basic assistance are available. On campus resources include:

- The Basic Needs Security Office of Leadership, Service, and Career, which offers information and support (SSM 130).  
*Contact Information*  
Phone: 209-631-3871  
[basicneeds@ucmerced.edu](mailto:basicneeds@ucmerced.edu)  
<https://basicneeds.ucmerced.edu>
- The Bobcat Pantry has free produce, shelf stable, and personal hygiene items available Monday, Wednesday and Thursday: 1:00pm - 5:00pm\* (TC 131) \*(Date and time subject to change during academic year.).
- UC Merced Food Distribution is a monthly food assistance program for all students, staff, and faculty in need. It offers participants with monthly food allotments.  
<https://studentlife.ucmerced.edu/content/uc-merced-food-pantry>
- CalFresh is a monthly stipend system that allows you to purchase food for no cost at all on your part. If you qualify for work study you most likely qualify for CalFresh.

*Contact Information*

[calfreshoutreach@ucmerced.edu](mailto:calfreshoutreach@ucmerced.edu)

<https://basicneeds.ucmerced.edu/calfresh-outreach>

Furthermore, please notify the lead instructor (VL) if you are comfortable in doing so. This will enable me to assist you with finding the resources you may need.

### **Final thoughts**

If you are in trouble (behind in homework, doing worse in the course than you would like, etc.) for whatever reason, please let the lead instructor know. Help and advice are available.

Because this is a 4-unit course, you should plan to do *at least* 12 hours of work on it, per week. Here is one suggestion for how to spend this time effectively:

- reading assigned material: 2 hours/week
- attending lectures and office hours: 2 hours/week
- attending and participating in discussion: 1 hours/week
- attending and participating in lab: 3 hours/week
- homework: 2 hours/week
- review, and preparation of review notes: 2 hours/week

It is a good idea to explicitly block out time for all these activities in your schedule. The same is true for your other courses too!



## MSE112--Materials Selection and Performance--Spring 2019 Schedule

Week	Day	Date	Lecture (provisional scope and contents)	Discussion	Lab	HW
1	M	21-Jan				
	T	22-Jan	Lecture 1: Introduction. The material life-cycle.	D1		
	W	23-Jan				
	R	24-Jan			L1	
	F	25-Jan				
2	M	28-Jan				
	T	29-Jan	Lecture 2: The design process.	D2		
	W	30-Jan				
	R	31-Jan			L2	
	F	1-Feb				
3	M	4-Feb				
	T	5-Feb	Lecture 3: Motivation for selection.	D3		
	W	6-Feb				
	R	7-Feb			L3	
	F	8-Feb				
4	M	11-Feb				
	T	12-Feb	Lecture 4: Engineering materials and their properties.	D4		
	W	13-Feb				
	R	14-Feb			L4	HW1 due
	F	15-Feb				
5	M	18-Feb	President's Day			
	T	19-Feb	Lecture 5: Establishment of service requirement and failure analysis.	D5		
	W	20-Feb				
	R	21-Feb			L5	
	F	22-Feb				
6	M	25-Feb				
	T	26-Feb	Lecture 6: Material property charts.	D6		
	W	27-Feb				
	R	28-Feb			L6	HW2 due
	F	1-Mar				
7	M	4-Mar				
	T	5-Mar	Lecture 7: The basics of materials selection.	D7		
	W	6-Mar				
	R	7-Mar			L7	
	F	8-Mar				

Week	Day	Date	Lecture (provisional scope and contents)	Discussion	Lab	HW
8	M	11-Mar				
	T	12-Mar	Lecture 8: Cost basis for selection.	D8		
	W	13-Mar				
	R	14-Mar			L8	HW3 due
	F	15-Mar				
9	M	18-Mar				
	T	19-Mar	Lecture 9: The formalization of selection procedures.	D9		
	W	20-Mar				
	R	21-Mar			Midterm	
	F	22-Mar				
10	M	25-Mar	Spring Recess			
	T	26-Mar	Spring Recess			
	W	27-Mar	Spring Recess			
	R	28-Mar	Spring Recess			
	F	29-Mar	Cesar Chavez Day			
11	M	1-Apr				
	T	2-Apr	Lecture 10: Specifications and quality control.	D10		
	W	3-Apr				
	R	4-Apr			L9	
	F	5-Apr				
12	M	8-Apr				
	T	9-Apr	Lecture 11: Eco-selection.	D11		
	W	10-Apr				
	R	11-Apr			L10	HW4 due
	F	12-Apr				
13	M	15-Apr				
	T	16-Apr	Lecture 12: Optimisation of Materials Properties in Living Systems.	D12		
	W	17-Apr				
	R	18-Apr			L11	
	F	19-Apr				
14	M	22-Apr				
	T	23-Apr	Lecture 13: Forces for change.	D13		
	W	24-Apr				
	R	25-Apr			L12	HW5 due
	F	26-Apr				

Week	Day	Date	Lecture (provisional scope and contents)	Discussion	Lab	HW
15	M	29-Apr				
	T	30-Apr	(Lecture 14:) Wiggle room/ project.	(D14) Wiggle room/ project.		
	W	1-May				
	R	2-May			L13	
	F	3-May				
16	M	6-May				
	T	7-May	(Lecture 15:) Wiggle room/ project.	(D15) Wiggle room/ project.		
	W	8-May				
	R	9-May			L14	HW6 due
	F	10-May	(Instruction ends)			