جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Fundamentals of Materials Sc. and Eng. - MSE 201

Division	Physical Science and Engineering Division
Course Number	MSE 201
Course Title	Fundamentals of Materials Sc. and Eng.
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	10:30 AM - 12:00 PM | Sun Tue

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Chun-Chih Tung	VINCENT.TUNG@KAUST.EDU.SA	+966128084842	3337, 5, Al-Kindi (bldg. 5)	1:00 PM - 2:00 PM | Sunday

Teaching Assistant(s)

Name	Email
Areej Aljarb	areej.aljarb@kaust.edu.sa

Course Information

Comprehensive Course Description	**Course goals:** You will apply a basic knowledge of physics, chemistry, mathematics and biology to develop an understanding of how structure and processing affect the properties and performance of materials. You will learn the basic principles of materials selection. **Learning outcomes** You will be able to -Identify which material properties mush be optimized for particular applications, -Identify candidate materials that, because of their composition and structure, exhibit those properties, and -Design viable processing strategies that achieve the necessary chemical and physical micro-structures in the chosen material. You will practice these skills – and hone the appropriate information-gathering, computational and data-handling proficiencies – in homework, laboratory, and discussion exercises. You will demonstrate these skills and proficiencies formally in the midterm and final examinations.
Course Description from Program Guide	Intended for students who do not have a materials science &engineering background. The course will cover four major topics including: fundamental concepts, microstructure development &phase equilibria, material properties and fabrication methods and applications. The course will cover atomic structure, atomic bonding, crystal structures, defects, and diffusion in materials. It also will cover phase transformations and phase equilibria and how they impact microstructure development. The electrical, magnetic, optical, thermal, and mechanical properties of materials will also be reviewed. The course will also highlight modern fabrication technologies and applications of metals, ceramics, semiconductors, and polymers.
Goals and Objectives	**Course goals:** You will apply a basic knowledge of physics, chemistry, mathematics and biology to develop an understanding of how structure and processing affect the properties and performance of materials. You will learn the basic principles of materials selection.

Required Knowledge	Students with general chemistry, phsyics, and mechanical engineering are encouraged but not required.
Reference Texts	*Materials Science and Engineering: An Introduction*, 9th Edition, 2014, by William D. Callister, Jr. and David G. Rethwisch. This edition incorporates some significant updates and improvements relative to previous editions.
Method of evaluation	**20.00**% - Presentation **30.00**% - Midterm exam **20.00**% - Homework /Assignments **30.00**% - Final exam
Nature of the assignments	**Presentation** Each week, a review article in the field of materials science and engineeirng will be assigned and a report is required for the following week. Noted that there will be two presentations, one before Midterm and one before Final Exam. Through the presentations, you will effectively combine the foremonts of advanced material research with the fundamental knowledge of materials science and engineering. **Homework** Homework is a critical component of this course and is designed to help you learn, understand and practice the material. Homework will be *due each week at the beginning of the Thursday lecture*, unless otherwise stated. **Late homework will not be accepted.** To account for illness and other emergencies, the lowest homework score will be dropped. 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. If you have access to solutions from a previous semester, you might feel tempted to use these as a substitute for doing your own work. While this might boost your homework score, it will be of little help in preparing you for the midterms, the final, and a successful professional career. **Exams** There will be one in-class midterm exams as indicated on the accompanying schedule. There will also be a comprehensive final exam. There will be no make-up exams. 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 any of the exams. However, calculators will be allowed when necessary, provided that they are not used to store data or formulae pertaining to the course.
Course Policies	**Special Accommodations** If you qualify for accommodations because of a disability, please submit a letter from Disability Services to the instructor in a timely manner so that your needs may be addressed. Student Affairs determines accommodations based on documented disabilities. The instructors 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 during the first week of class regarding any potential academic adjustments or accommodations that may arise due to religious beliefs. **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 us know. We'll try to help! As is always the case at university, there is quite a lot of material in this course, and not a lot of time in which to learn it. There are many resources available to help you. We strongly encourage you to take advantage of them. Because this is a 200-level course, you should plan to do *at least 10* hours of work on it, per week. Here is one suggestion for how to spend this time effectively: -reading the textbook ahead of the lectures: ? 3 hours/week -attending the lectures: ? 3 hours/week -attending and participating in lab/discussion: 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! ?
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Sun 01/27/2019 Tue 01/29/2019	Atomic structure and Interatomic bonding
2	Sun 02/03/2019 Tue 02/05/2019	Advanced light source, Lawrence Berkeley National Lab
3	Sun 02/10/2019 Tue 02/12/2019	The structure and imperfection of crystalline solids
4	Sun 02/17/2019 Tue 02/19/2019	Diffusion
5	Sun 02/24/2019 Tue 02/26/2019	Mechanical properties of Metals: dislocation and strengthening mechanisms
6	Sun 03/03/2019 Tue 03/05/2019	Mechanical properties of Metals: dislocation and strengthening mechanisms II
7	Sun 03/10/2019 Tue 03/12/2019	**Phase diagrams I & Midterm I**
8	Sun 03/17/2019 Tue 03/19/2019	Phase transformation & Application and processing of metal alloys
9	Sun 03/24/2019 Tue 03/26/2019	Spring Break
10	Sun 03/31/2019 Tue 04/02/2019	Group presentation
11	Sun 04/07/2019 Tue 04/09/2019	Structure properties of ceramics
12	Sun 04/14/2019 Tue 04/16/2019	Application and processing of ceramics
13	Sun 04/21/2019 Tue 04/23/2019	Polymer structures
14	Sun 04/28/2019 Tue 04/30/2019	Characteristics, applications and processing of polymers
15	Sun 05/05/2019 Tue 05/07/2019	Composites
16	Sun 05/12/2019 Tue 05/14/2019	Corrosion and degradation of materials
17	Sun 05/19/2019 Tue 05/21/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.