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

Course Syllabus: Thermodynamics & Equilibrium Processes - MSE 226

Division	Physical Science and Engineering Division
Course Number	MSE 226
Course Title	Thermodynamics & Equilibrium Processes
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 | Wed , 01:00 PM - 02:30 PM | Mon

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Frederic Laquai	frederic.laquai@kaust.edu.sa	+966128087243	3233, 5, Al-Kindi (bldg. 5)	8AM - 6PM.
Derya Baran	DERYA.BARAN@KAUST.EDU.SA	+966128087238	3236, 5, Al-Kindi (bldg. 5)	

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	This course provides an overview of the fundamental concepts in thermodynamics and their application in Materials Science. The following topics will be covered: review of the laws of classical thermodynamics, thermodynamic processes and cycles (Carnot and others), ideal and real gases, basics of statistical thermodynamics, solution theory and mixtures of gases and liquids, phase equilibria in single-component, binary, and ternary systems, chemical equilibria, surface and interface thermodynamics, chemical kinetics, kinetic gas theory, and polymer thermodynamics.
Course Description from Program Guide	The course offers a modern fundamental understanding of the main concepts and practical applications of thermodynamics in materials science. The following major topics are discussed: review of the laws of classical thermodynamics, introduction to statistical thermodynamics phase equilibria, including phase diagrams, theory of solutions, chemical reactions involving gases and condensed matter, Ellingham diagrams, surface and interfacial phenomena, and thermodynamics at the nanoscale.
Goals and Objectives	Objective 1: The student will learn basic concepts of classical and statistical thermodynamics needed to understand thermodynamic principles and their application. Objective 2: The student will learn to read and interpret phase diagrams of single-component, binary, and ternary systems. Objective 3: The student will learn to solve basic thermodynamic problems.
Required Knowledge	MSE200: Students should have attended this course or attend as co-requisite or should provide proof of sufficient math knowledge to be able to follow this course.
Reference Texts	1.) Physical Chemistry, Peter Atkins, Oxford University Press, Eighth Edition, 2006 2.) Introduction to the Thermodynamics of Materials, David R. Gaskell, Taylor & Francis, Fifth Edition, 2008 3.) Thermodynamics & Kinetics in Materials Science, Bokstein, Mendelev, Srolovitz, Oxford, 2005

Method of evaluation	**30.00**% - Homework /Assignments **30.00**% - Midterm exam **40.00**% - Final exam
Nature of the assignments	Weekly homework - problem solving: typically 2-4 problems closely related to the topics of that week's lectures.
Course Policies	Attendance is mandatory; not handing back the homework in time will result in a “0” grade.
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Mon 01/28/2019	Course Overview and Math Basics
1	Wed 01/30/2019	Thermodynamic Processes
2	Mon 02/04/2019	Thermochemistry
2	Wed 02/06/2019	Fundamental Laws of Thermodynamics
3	Mon 02/11/2019	Thermodynamic Cycles
3	Wed 02/13/2019	Thermodynamic Cycles II
4	Mon 02/18/2019	Auxiliary Functions
4	Wed 02/20/2019	Auxiliary Functions II
5	Mon 02/25/2019	Real Gases
5	Wed 02/27/2019	Introduction to Statistical Thermodynamics I
6	Mon 03/04/2019	Introduction to Statistical Thermodynamics II
6	Wed 03/06/2019	Solution Theory and Mixtures I
7	Mon 03/11/2019	Solution Theory and Mixtures II
7	Wed 03/13/2019	Review of Topics
8	Mon 03/18/2019	Midterm Exam
8	Wed 03/20/2019	Midterm Exam Results and Discussion
9	Mon 03/25/2019	Spring Break
9	Wed 03/27/2019	Spring Break
10	Mon 04/01/2019	Phase Equilibria and Single Component Systems I
10	Wed 04/03/2019	Phase Equilibria and Single Component Systems II
11	Mon 04/08/2019	Binary Phase Diagrams
11	Wed 04/10/2019	Binary and Ternary Phase Diagrams
12	Mon 04/15/2019	Chemical Equilibria
12	Wed 04/17/2019	Surface Thermodynamics I
13	Mon 04/22/2019	Surface Thermodynamics II
13	Wed 04/24/2019	Reaction Dynamics I
14	Mon 04/29/2019	Reaction Dynamics II
14	Wed 05/01/2019	Kinetic Gas Theory
15	Mon 05/06/2019	Kinetic Gas Theory II
15	Wed 05/08/2019	Thermodynamics of Macromolecules
16	Mon 05/13/2019	Review of Topics / Problem Solving
16	Wed 05/15/2019	Review of Topics / Problem Solving II
17	Mon 05/20/2019	Final Exam Week
17	Wed 05/22/2019	Final Exam Week

Note

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