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

Course Syllabus: Statistical Thermodyn & Equalib Process - MSE 303

Division	Physical Science and Engineering Division
Course Number	MSE 303
Course Title	Statistical Thermodyn & Equalib Process
Academic Semester	Spring
Academic Year	2016/2017
Semester Start Date	01/22/2017
Semester End Date	05/18/2017
Class Schedule (Days & Time)	10:30 AM - 12:00 PM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Frederic Laquai	frederic.laquai@kaust.edu.sa	+966128087243	3233, 5, Al-Kindi (bldg. 5)	Sunday, 2-4PM Wednesday, 10AM-12PM

Teaching Assistant(s)

Name	Email
Ahmed Balawi	ahmed.balawi@kaust.edu.sa

Course Information

Comprehensive Course Description	This course provides a fundamental understanding of the main concepts and applications of thermodynamics in materials science from a physical chemistry perspective. The following major topics are discussed: ideal and real gases, review of the laws of classical thermodynamics, thermodynamic processes and cycles, introduction to statistical thermodynamics, solution theory and mixtures, 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 to the main concepts and practical applications of thermodynamics in materials science. The following major topics are discussed within the frame of this course: review of basic laws of classical thermodynamics, an introduction to phase equilibria including the theory of solutions, chemical reaction and surface and interfacial phenomena. Additionally, an introduction to statistical thermodynamics of gases and condensed matter is provided.
Goals and Objectives	Objective 1: The student will learn the basic concepts of classical and statistical thermodynamics to **perform** basic thermodynamics calculations. 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 problems** of (chemical) kinetics.
Required Knowledge	No official prerequisite; knowledge of basic math including functions, (partial) derivatives, integrals, series expansions, and 1st / 2nd order differential equations is of advantage, but will be reviewed throughout the 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	**40.00**% - Final exam **30.00**% - Midterm exam **30.00**% - Homework /Assignments
Nature of the assignments	Weekly homework - problem solving: typically 2-4 problems closely related to the topics of that week's lectures.
Course Policies	**Class policy:** Attendance to the class is required; 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 01/23/2017 Thu 01/26/2017	Mon: Basic math and the ideal gas Thu: Thermodynamic processes
2	Mon 01/30/2017 Thu 02/02/2017	Mon: Thermochemistry Thu: Basic laws of thermodynamics
3	Mon 02/06/2017 Thu 02/09/2017	Mon: Thermodynamic cycles Thu: Thermodynamic cycles II
4	Mon 02/13/2017 Thu 02/16/2017	Mon: Auxiliary functions I Thu: Auxiliary functions II
5	Mon 02/20/2017 Thu 02/23/2017	Mon: Real Gases Thu: Statistical thermodynamics I
6	Mon 02/27/2017 Thu 03/02/2017	Mon: Statistical thermodynamics II Thu: Solution Theory and Mixtures I
7	Mon 03/06/2017 Thu 03/09/2017	Mon: Solution Theory and Mixtures II Thu: **Midterm exam**
8	Mon 03/13/2017 Thu 03/16/2017	Mon: Phase Equilibria Thu: Single Component Phase Diagrams
9	Mon 03/20/2017 Thu 03/23/2017	Mon: Binary Phase Diagrams Thu: Binary and Ternary Phase Diagrams
10	Mon 03/27/2017 Thu 03/30/2017	Mon: Chemical Equilibria Thu: Surface Thermodynamics I
11	Mon 04/03/2017 Thu 04/06/2017	Spring Break
12	Mon 04/10/2017 Thu 04/13/2017	Mon: Surface Thermodynamics II Thu: Chemical Kinetics I
13	Mon 04/17/2017 Thu 04/20/2017	Mon: Chemical Kinetics II Thu: Kinetic Gas Theory
14	Mon 04/24/2017 Thu 04/27/2017	Mon: tbd Thu: tbd
15	Mon 05/01/2017 Thu 05/04/2017	Mon: tbd Thu: tbd
16	Mon 05/08/2017 Thu 05/11/2017	Mon: tbd Thu: tbd
17	Mon 05/15/2017 Thu 05/18/2017	Mon: **Final exam**
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Note

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