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Statistical Thermodynamics and Equilibrium Processes - Course Syllabus

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Course Number: MSE 303

Course Title: Statistical Thermodynamics and Equilibrium Processes

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan 24, 2016	**Semester End Date:**	May 19, 2016

Class Schedule: Mon / Thu, 10:30-12:00

Classroom Number: TBD

Instructor(s) Name(s): Frédéric Laquai
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Office Location: Building 5, Office 3275

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.

COMPREHENSIVE COURSE DESCRIPTION

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 of single component, binary and ternary systems, theory of solutions, chemical reactions involving gases and condensed matter, Ellingham diagrams, surface and interfacial phenomena, thermodynamics at the nanoscale, and thermodynamics of polymeric materials.

GOALS AND OBJECTIVES

Objective 1: The student will get familiar with the basic concepts of thermodynamics and learn to perform basic thermodynamics calculations.

Objective 2: The student will be able to read and interpret phase diagrams of single component, binary and ternary mixtures.

Objective 3: The student will be able to apply thermodynamics concepts to chemical reactions, mixtures, solution formation, etc.

REQUIRED KNOWLEDGE

No official prerequisite, but prior exposure to mathematics is very useful such as: definition of functions, (total) derivatives, integration, differential equations, taylor expansion, and basic integration and differentiation rules. A short overview and

REFERENCE TEXTS

1.) Introduction to the Thermodynamics of Materials, by D.R. Gaskell, Taylor & Francis,

ISBN 1-56032-992-0

2.) Physical Chemistry, by Peter Atkins, Oxford University Press.

METHOD OF EVALUATION

Percentages %	Graded content
30% **40%** **30%**	**Week 7/8: Midterm** **Week 16: Final Exam** **Quizzes and Homework**

COURSE REQUIREMENTS

Assignments

Homework: problem solving

Course Policies

Class policy: Attendance to the class is highly recommended; not handing back the homework in time will result in a “0” grade.

Additional Information

Additional reference: Thermodynamics and Kinetics in Materials Science, B.S. Bokstein, M.I. Mendelev and D.J. Srolovitz, Oxford Univ. Press, ISBN 0-19-852804-3

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