

CHM6430, Chemical Thermodynamics, Fall 2016

INSTRUCTOR: Prof. Russ Bowers, bowers@chem.ufl.edu

OFFICE: Physics Building, Rm. 2360

OFFICE HOURS: MW, 1:30-3:30pm

COURSE DESCRIPTION:

This course covers the basic concepts of chemical thermodynamics and kinetics with a focus on applications. It is expected to be useful to all students who will use physical chemistry concepts in their research, and it can be beneficial as a refresher. The course will be taught at a level slightly higher than a standard undergraduate physical chemistry course.

MEETING PLACES AND TIMES:

Tuesday, 7th period, Weimer Hall (WEIM) Rm. 1092

Thursday, 6-7th periods, Physics Building (NPB) 1200

REQUIRED TEXTS:

Thermodynamics and Chemistry, by Howard Devoe, 2nd Edition, Version 7a (2015). <http://www2.chem.umd.edu/thermobook/> (free download)

Molecular Thermodynamics, by D.A. McQuarrie and J.D. Simon, University Science Books, Sausalito, CA; ISBN 1-891389-05-X.

RECOMMENDED SOFTWARE: [Wolfram's Mathematica](#).

GRADING SCHEME

	weight
Midterm Exams (2)	40%
Homework	20%
Special Projects (2)	40%

ATTENDANCE: 100% attendance is expected.

MAKE-UP EXAMS: Must be arranged in advance of the scheduled date. No make-up exams are allowed otherwise except for emergency situations.

UF GENERAL INFORMATION ABOUT GRADES:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

TOPICS TO BE COVERED

Systems and Their Properties
The First Law: Energy Is Conserved.
Spontaneous, Reversible and Irreversible Processes
Energy transfer by work and heat

Entropy
The Second Law of Thermodynamics
Third Law of Thermodynamics

Enthalpy, Helmholtz and Gibbs energies
Criteria for Spontaneous Change
Equilibrium

Pure Substances in Single Phase
Chemical Potential

Phase Transitions
Mixtures
Activities

Electrolyte Solutions
Debye Hückel Theory
Mean Ionic Activities

Reactions and Chemical Processes
Thermodynamics of Mixing
Molar Reaction Enthalpy
Gibbs Energy and Reaction Equilibrium
Thermodynamic Equilibrium Constant

Phase Equilibria
Gibbs Phase Rule

Galvanic Cells
Nernst Equation
Cell EMF

Kinetics: Reaction Mechanisms and Rate Laws
Transition-State Theory
Ionic Reactions
Diffusion-Controlled Reactions

Biochemical Applications of Thermodynamics

Enzyme Kinetics
Michaelis-Menten Kinetics. Competition and Inhibition.