**CHEMISTRY 427/1480 COURSE Syllabus – 2018**

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**Reference Books:**
Statistical Mechanics, by Donald A. McQuarrie (M)
Statistical Physics: Statics, Dynamics and Renormalization, L.P. Kadano (K)
A Modern Course in Statistical Physics, L.E. Reichl: a bit more difficult

**TOPICS TO BE COVERED:**
Equilibrium Statistical Mechanics:
Classical Mechanics and Statistics Review, Chapter 1:M
Ensembles and Fluctuations, Chapters 2,3,7:M
Quantum Statistical Mechanics, Chapters 4-6,8-10:M
Distribution Functions, Chapter 13:M

Dynamics and the Approach to Equilibrium:
Lattice models and Stochastic Dynamics
Liouville equation, Fokker-Planck Equation, Chapter 6:K
Response Theory and Time Correlation functions
Computer Simulation (to be discussed)

The above is only general and specific chapters and order may change. Overall, the intent of this course is to give the proper grounding in the use of Statistical Mechanics to properly understand the dynamical properties of matter. In keeping with my teaching philosophy that one only learns by doing and that the learning must be connected directly to one's career interests (part of one's survival kit), there will also be the opportunity to explore a current research problem in which a deep understanding of Statistical Mechanics is essential to understand the phenomenon of interest. You will also be asked to prepare derivations for presentation in class to help better reinforce the material.

**GRADING:**
1. 3 Problem Sets - 45%
2. Take home final exam - 25%
3. Research Proposal/Presentation – 30%

The research proposal will be approximately 5 pages on a current research topic with a presentation of the theory or experiment and proposed extensions of the work. Grading will be 20% for the written part and 10% on oral presentation and questions. A separate guideline for the proposals will be given 1 week before the assignment.