

Instructor: Dr. Alan R. Denton
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Meetings: TTh 1:45-3:00 p.m.
South Engineering 212C

Office Hours: By arrangement
South Engineering 214B

Goal: Develop conceptual and technical mastery of theoretical and computational methods of statistical physics and applications to a variety of many-particle systems.

Preparation: Basic knowledge of mechanics, thermodynamics, statistics, and mathematical methods. Some experience with programming and numerical methods.

Student Responsibilities: Attend all classes. Read assigned material in advance. Come prepared for discussion. Be curious; ask questions. Complete assignments on time.

Text: David Chandler, Introduction to Modern Statistical Mechanics (Oxford, 1987).

Evaluation: Homework 50%, Projects 50%

Topics: The following list may be modified to match students' interests.

- Microstates, macrostates, and fundamental postulates
- Ensembles, ensemble averages, and statistical fluctuations
- Boltzmann distribution and partition function (sum over states)
- Relationship between statistical mechanics and thermodynamics
- Noninteracting systems: photons, phonons, electrons, ideal gas of particles
- Phase equilibria and phase transitions
- History and foundations of computer simulation
- Monte Carlo simulation and ensemble averages
- Molecular dynamics simulation and time averages
- Interacting classical fluids: correlation functions
- Density-functional and integral-equation methods
- Statistical mechanics of nonequilibrium systems

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, section 335: Code of Academic Responsibility and Conduct:

<http://www.ndsu.nodak.edu/policy/335.htm>

Any students with disabilities who need accomodation in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements.