Chem-Che 557: Physical Chemistry I

**Total Credit:** Three

**Lecturer:** Reinhard Schweitzer-Stenner; [RSchweitzer-Stenner@drexel.edu](mailto:RSchweitzer-Stenner@drexel.edu), Disque Hall 218, phone: 215-895-2268

**Textbook:** For chapter 1: *Peter Atkins and Julio de Paula, Physical Chemistry, 7th edition (an earlier edition is also o.k.)* or *Laidler, Meiser, Sanctuary, Physical Chemistry,* in principle the contents can be obtained from any Physical Chemistry textbook *Physical Chemistry textbooks have been reserved for this course in the library, first floor to the left and around the corner from the Circulation desk.* For the remaining chapters: Charles Kittel and Herbert Kroemer, *Thermal Physics (Freeman and Company, ISBN 0-7167-1088-9).* A purchase of the Kittel/Kroemer is recommended.

**Assignments:** Home assignments will generally be provided on Wednesday and shall be submitted by 12.00 a.m. on the Friday of the week which follows. The assignments will be graded and count 50%.

**Exams and Homeworks:** Besides the final there will be a written midterm, open book exams. It will count for 25% of the grade. Students are allowed to bring along with themselves all types of textbooks and class notes. The final exam also counts 25%. I am currently planning to organize the final as a mini-symposium with presentations from students, which will be graded. These presentations will mostly be based on research papers and book chapters. I have still to check whether or not this is a possible option. The final grade will be obtained on the basis of the total score, i.e. $0.5*assignment\ points + 0.25*mid-term-exam\ points+0.25*final\ exam\ points$. The grading scheme for homework is A: 100-90 P, B: 89.99-70 P, C: 69.99 P-60 P, D: 59.99-50 P, F; less than 50 P., for the midterm exam A: 100-85 P, B: 84.99 – 70 P, C: 69.99 P- 55P, D: 54.99 – 40 P, F: < 40 P. The final grade will be calculated by using the following scheme: $A\geq1$, $B\geq2$, $C\geq3$, $D\geq4$, $F\leq5$ (add 0.25 for a minus and subtract 0.25 for a +) to calculate an average number of the weighted grades of homework and exams and than converted back into the number code.

**Complaints:** Complaints about the grading of assignments and exams have to be brought to the attention of the lecturer within 48 hours after their return. All grades are considered final afterwards.

**Drop out:** According to Drexel University policy, students are allowed to drop courses until the last day of the sixth week.

**Office hour:** To comply with Drexel policy I officially offer office hours on Monday from 3.30 through 5.00 p.m. However, students are urged to see me in my office in the case of any problems and questions.
Principal philosophy: The course will emphasize conceptual thinking instead of memorizing. Students shall be prepared to employ concepts introduced in class to a variety of problems. Exams will frequently contain questions, which check the understanding of the subject. It is assumed that the participating students have a solid working knowledge of pre-calculus and calculus. The lecturer will be ready to work on mathematical deficiencies, if this is necessary.

Behavior in class: Students are asked to appear on time for the class and to switch off their cellular phones. Cheating will lead to an F for the entire course. I am encouraging discussions, but not chattering while I am lecturing.

Syllabus

1. Recollecting phenomenological thermodynamics
   - The first law: work, heat and energy
   - The second law: entropy and reversibility
   - Phase diagrams
   - Chemical equilibrium

2. The microcanonical ensemble
   - Elementary statistics
   - Binary systems

3. The 2nd law revisited
   - Energy exchange
   - Entropy
   - Statistical definition of temperature
   - 2nd law of thermodynamics
   - Energy and temperature
   - Energy and entropy

4. The canonical ensemble
   - System and reservoir
   - Free energy
   - Helix ↔ coil transitions
   - Pressure
   - Ideal gas

5. Thermal radiation
   - Planck distribution
   - Stefan-Boltzmann and Planck law
   - Phonons in solids