PHY 455 - Thermal Physics

Syllabus **Dr. R.L. Herman** **Spring 2014**

Instructor: Dr. R. Herman
Office Hours:
MWF 9:00-10:00 AM, TR 9:30-11:00 AM
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Course Content:

Required Texts: *Statistical and Thermal Physics,* H. Gould and J. Tobochnik, 2010. *Thermodynamics*, E. Fermi, Dover, 1956. *Schaum's Theory and Problems of Thermodynamics*, M. M. Abbot and H. C. Van Ness

Optional Texts: *Thermodynamics and the Kinetic Theory of Gases,* W. Pauli, Dover, 2010. *Statistical Physics*, W. Pauli, Dover, 2000, *Fundamentals of Physics*, D. Halliday, R. Resnick, and J. Walker, Ch 18-20.

In this class we will cover a variety of topics in thermal physics. These will include the laws of thermodynamics, heat energy, entropy, free energy, thermodynamic potentials, probability distributions, central limit theorem, statistical mechanics, ensembles, magnetic systems, Fermi and Bose systems, blackbody radiation, and phase equilibria.

Course Objectives:

By the end of the course, students should be able to demonstrate a knowledge and broad understanding of thermal physics. Students should be able to describe and quantitatively analyze thermodynamic processes, relationships and techniques; apply these ideas and techniques to solve problems; write down and either prove or explain the underlying basis of the physical laws relevant to the course topics; discuss applications and the relation of thermal concepts in other courses.

Thermal physics is the physics of energy, heat, work, and entropy. It encompasses classical thermodynamics, kinetic theory, and statistical mechanics. It is essential to understanding a vast number of applications from car engines and refrigerators to biological systems and information technology. It is central to physics as well since quantum mechanics was developed in part to explain the specific heat of gases and blackbody radiation. The second law of thermodynamics has recently become a hot topic in the description of black bodies and it fundamental to understanding the arrow of time.

Thermal physics is different from other courses being that is has been developed across several fields (physics, chemistry, biology, engineering). This has lead to a variety of notations, definitions, and applications of the field. We will also be dealing with macroscopic vs microscopic views of the systems we are considering. You will be challenged to think about the material. This is not a course in which memorization is as important as coming to terms with the central ideas of the subject. Once you have these down, then the mathematical formalism should follow. With this said - you should plan to devote a considerable amount of time to reading and thinking about the subject. Spend time after each class asking questions - How does this fit into my perception of the world? Does it make sense? Can I explain this to others? Does what I have just learned conflict with what I think I know? If so, you need to resolve that conflict! That is what learning is about. You should also work as many problems as you can. Do more than the instructor has asked of you!

Advice for Success

In order to learn the material in this course and earn a good grade, you need to put in some effort. Do not put off assignments or reading. If you do not understand something, ask the instructor. Come to office hours, use email, ask knowledgeable students, or go to the library/internet and find supplementary material. It is recommended that you also read and work problems in an introductory text like Halliday, Resnick and Walker. This will help you to keep in touch with the physics and not get lost in the details. Additional material will be placed at the course website:

http://people.uncw.edu/hermanr/phy455.

The instructor can only cover the basics in class. You are not expected to know the material by only listening to the lectures. You need to work problems and think about what you are doing.

Course Requirements:

Attendence: YOU ARE EXPECTED TO ATTEND ALL OF THE LECTURES! After three excused absences, there will be a penalty of 2% for each absence from your total grade.

Homework: Homework assignments will be collected on a regular basis and you will be told when the work is due. As doing homework is very important for learning the material in this course, it will count as 30% of your grade.

Projects/Papers: There are many interesting areas that might best be explored by individuals, or groups, outside the classroom. Such topics may arise in the course of the semester. You will be required to do at least two in-depth papers/projects in this class. This will count 10% of your grade.

Exams and Grades: There will be three exams and a final for this course. The exams will cover the basic material up to the date of the exam. The tentative dates for the exams are below. (The Chapter topics are in Gould and Tobochnik.)

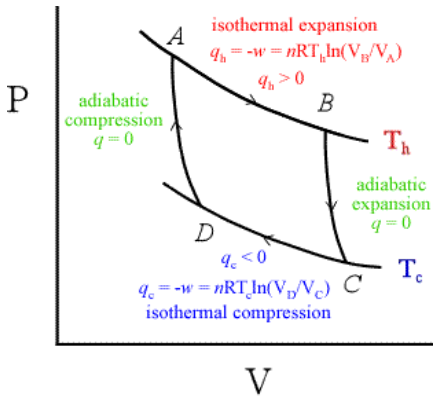
Exams	**Chaps**	**Date**
Exam I	1-2	Feb 12
Exam II	3-4	Mar 19
Exam III	5-6	Apr 25
Final	1-7+	May 7, 8:00 AM

Your final grade will be based on the following:

Homework	30%
Project/Papers	10%
Exams	40%
Final	20%

90-100	A
80-89.5	B
70-79.5	C
60-69.5	D

Plus-minus grading may be used in special cases.
This syllabus is subject to change!



Academic Honor Code: All members of UNCW's community are expected to follow the academic Honor Code. Please read the UNCW Honor Code carefully (as covered in the UNCW Student Handbook). Academic dishonesty in any form will not be tolerated in this class. Please be especially familiar with UNC-W's position on plagiarism as outlined in the UNCW Student Handbook. Plagiarism is a form of academic dishonesty in which you take someone else's ideas and represent them as your own.

Student Disabilities: UNCW Disability Services supplies information about disability law, documentation procedures and accommodations that can be found at http://www.uncw.edu/stuaff/disability/.To obtain accommodations the student should first contact Disability Services and present their documentation to the coordinator for review and verification.

Campus Respect Compact. UNCW has recently instituted a Respect Compact to affirm our commitment to a civil community, characterized by mutual respect. That Compact will soon be affixed to the wall of each classroom and can be accessed at: http://www.uncw.edu/stuaff/pdc/documents/SeahawkRespectCompact.pdf .