

- COURSE:** **Statistical Mechanics**
Tuesdays & Thursdays 9:30am - 10:45pm, CP 179
- INSTRUCTOR:** **Prof. Isaac Shlosman**
Office - CP 117C (phone 257-3461)
Office Hours – Mondays, Wednesdays, 11:00am to 12:00pm
I am flexible: my office, or easily can zoom and answer emails
e-mail: isaac.shlosman@uky.edu
I will use Canvas for communication
<http://www.pa.uky.edu/~shlosman/632.html>
- GRADER:** **Nico Cooper**
Office - CP 305, e-mail: nco241@g.uky.edu
- TEXTBOOKS:** 1. *Statistical Mechanics*,
by R.K. Pathria (Elsevier), Third Edition (recommended)
2. Additional helpful books:
Equilibrium Statistical Physics by M. Plischke & B. Bergersen,
3rd edition (World Scientific)
Fundamentals of Statistical & Thermal Physics by F. Reif
Statistical Physics by E.M. Lifshitz & L.P. Pitaevskii
Statistical Mechanics by K. Huang

COURSE DESCRIPTION & OBJECTIVES: This is a graduate level course in Statistical Mechanics. The prerequisites are Advanced Mechanics (PHY 504), Introduction to Quantum Mechanics (PHY 520), and Thermodynamics & Statistical Physics (PHY 521/522) or their equivalents. Knowledge of this material will be assumed, but we will re-do some of it. Stat. Mech. is a core course and deals with fundamental principles of thermodynamics and statistical physics (kinetic theory, entropy, classical and quantum statistics, ideal Bose and Fermi systems, phase transitions and more).

COURSE EVALUATIONS: Course evaluations are an important (and mandatory!) component of our Department's instructional program. This semester our Department will use the TCE student evaluations system which is used university wide. These evaluations will be held during the last two weeks of class.

COURSE REQUIREMENT: Problem sets will be usually distributed to students every 7-10 days in class. These problem sets must be handled in on time (in a week time, in class!) and must reflect student's own work. LECTURE NOTES are posted on the course webiste.

TESTS: There will be a **Midterm Test** (in class), tentatively on Thursday, March 12, will be confirmed after consultation with students.

Final Exam on Tuesday, May 5, 8:00am – 10am, CP 179. We will need to add additional time. This will be consulted with students.

ATTENDANCE and WORK ETHICS: I do not take attendance roll and have no specific attendance policy. However, isn't it obvious that (unless you are a genius) class attendance is required to get a good grade or to learn something? If attendance becomes a problem, I reserve the right to institute brief quizzes, or else...

If you miss a test for a legitimate reason, you may request a makeup test. Examples of legitimate absence are illness of the student or a member of immediate family, death in the family, and major religious holidays. If your absence occurs because of a scheduled event you should inform the instructor *in advance* of the test date. In all cases, relevant documentation must be given to the instructor. You should request a makeup within *one week* of the originally scheduled test. If you need to reschedule the final exam because of a conflict with another exam, University regulations require that you submit your request in writing *two weeks* in advance.

Discussing the homework and collaborating with the fellow students is acceptable, but the turned-in solutions must display independent work. Moreover, you are encouraged to work on the course material with other students, but remember that you will be graded on your own work. Cheating and plagiarism in homework and tests is a serious academic offense. Violators of the academic code are subject to punishment in accordance to University Senate Rules section 6.3 and 6.4. Late homework will not be accepted.

GRADES: The final letter grade in this course will be determined by your scores from the *Midterm* (30%) *Problem Sets* (30%) and the *Final* (40%). The letter scores are defined as: A (86-100%), B (71-85%), C (56-70%), and E (55% and less). The letter score C is the passing grade. You must pass the final exam in order to obtain the passing grade. If you are an undergraduate student, please inform me.

SERVICES OF THE TEACHING ASSISTANT: *NONE*. However the students are welcomed to discuss any subject of interest with the instructor.

COURSE OUTLINE (may be re-shuffled and modified!):

1. Review of Thermodynamics (Ch. 1 of Plischke & Bergersen)
2. Probability
3. Statistical Ensembles for classical and quantum systems (Ch. 1-6 of Pathria & Beale; Ch. 2 of Plischke & Bergersen)
4. Classical Statistical Mechanics
5. Systems of Interacting Particles
6. Quantum Statistical Mechanics (Ch. 7-8 of Pathria & Beale)
7. Phase Transitions (Ch. 12-14 of Pathria & Beale)
8. Critical Phenomena (Ch. 12 of Pathria & Beale; Ch. 6 of Plischke & Bergersen)
9. Gravo-Thermodynamics and Gravo-Statistical Mechanics (if the time will allow)