Course title: PHYS404 Introduction to statistical thermodynamics

Instructor: Asst. Prof. Vladimir Manucharyan (vmanuchar@gmail.com)

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Office hours: By appointment, or just stop by.

Required text: D. Schroeder, Introduction to Thermal Physics.

Course Syllabus:
(numbers indicate reading paragraphs from the Schroeder book)

1. T Jan 28
Temperature; 0th law of thermodynamics; 1.1 - 1.2

2. Th Jan 30
Work; Equipartition principle; 1st law of thermodynamics; 1.3 - 1.4

3. T Feb 4
Heat capacity; Quasistatic (slow) processes; 1.5 - 1.6

4. Th Feb 6
Probability; Discrete models of many-particle systems; 2.1 - 2.3

5. T Feb 11
Probability; Continuous models; 2.4 - 2.5

6. Th Feb 13
Entropy; Reversible and irreversible processes; 2.6

7. T Feb 18
Linking temperature, entropy, and heat; 3.1 - 3.2

8. Th Feb 20
Paramagnetism; 3.3

9. T Feb 25
Pressure; Mechanical equilibrium; 3.4

10 Th Feb 27
Chemical potential; Diffusive equilibrium; 1.7; 3.5

11. T March 4 MIDTERM1

12. Th March 6
Heat engines and refrigerators; Carnot cycle; real engines; 4.1 - 4.2; 4.3 - 4.4 optional

13. T March 11
Free Energy as Available Work; thermodynamics identities; 5.1

14. Th March 13
Free Energy as a force towards equilibrium; 5.2

T March 18 SPRING BREAK
Th March 20 SPIRNG BREAK

15. T March 25
Phase transitions; Phase diagrams; van der Waals equation; liquid-gas transition; 5.3

16. Th March 28
Thermodynamics of mixtures; 5.4 - 5.5

17. T April 1
Partition function; Equipartition theorem; Boltzman distribution (1); 6.1 - 6.5

18. Th April 3
Partition function; Equipartition theorem; Boltzman distribution (2); 6.1 - 6.5

19. T April 8
Certain calculations using partition function; 6.6 - 6.7

20. Th April 10 MIDTERM2

21. T April 15
Gibbs distribution; Bosons and fermions; 7.1 - 7.2

22. Th April 17
Fermi gas; Properties of metals and stars; 7.3

23. T April 22
Photon gas; Plank's distribution; 7.4

24. Th April 24
Phonon gas; Debye model of solids; 7.5

25. T April 29
Bose-Einstein condensation; 7.6

26. Th May 1
Ising model of a ferromagnet; 8.2

27. T May 6
Physics of Information

28. Th May 8
Selected topics in modern statistical physics

29. T May 13
REVIEW/FINAL EXAM (tbd)

Homework:

There will be 10 problem sets, approximately 2 for every 3 weeks.