<u>SYLLABUS</u>

Physics 715
Statistical mechanics
Fall, 1997

Instructor: Associate Prof. Andrey V. Chubukov

Address: B307 Sterling

Office hours   Any time, but please be reasonable

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Text: L.D. Landau, E.M. Lifshitz Statistical Physics, part 1, Pergamon Press, 1980;
Kerson Huang <u>Statistical Mechanics</u>, John Wiley & Sons, Second Edition;
Both textbooks are available for purchase in the University Bookstore and
are on reserve at the Physics Library.

Tentative Schedule of Topics

9/3 -9/10   Introduction. Fundamental Principles of Statistical Physics. HUANG
                   $$ 1.1, 1.4, 6.1, 6.2; LANDAU $$ 1-3, 7, 8

9/12-9/22   Thermodynamic variables. The laws of Thermodynamics. HUANG
                   $$ 1.2, 1.3, 1.5-1.7; LANDAU $$ 9-16, 19-21, 23-24

9/24-10/3   Gibbs and Maxwell distributions. HUANG $$ 4.1-4.2; LANDAU $$
                   28, 29, 31, 35, 36

10/6-10/13   Equilibrium state of a dilute gas. Magnetism of gases. HUANG $$4.1-
                   4.5; LANDAU $$ 38-44, 52

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10/6-10/13	Mid-term exam
10/15-11/5	Quantum gases. Fermi and Bose gases. Magnetism of electronic gas. Imperfect Fermi gas. Superfluidity. Liquid He. HUANG $$ 11.1-11.7, 12.1-12.5, 13.1-13.8; LANDAU $$ 53-60, 62, 63
11/7-11/14	Nonideal gases. Van-der-Vaals formula. Liquid-gas transition. HUANG $$ 2.2, 2.3; LANDAU $$ 74, 76, 81, 83, 84
11/10-11/17	Mid-term exam
11/17-11/24	Magnetism. Mean-field theory. HUANG $$ 14.1, 14.3, 16.1, 16.3
12/1-12/12	Phase transitions and Critical Phenomena. Landau theory. Scaling approach. Critical exponents. HUANG $$ 16.4, 16.5, 17.1-17.4, 17.8, 17.9, 18.1-18.7; LANDAU $$ 142-150
12/15-12/22	FINAL EXAM

Three credit students

1. Exams. Each three-credit student will take a total of three exams (including the final exam). Each mid-term exam will have 3 questions, final exam will have 5 questions. Exam dates are listed on the Schedule of Topics. The dates are tentative and are subject to change. Exams will cover the assigned lectures. Approximately 2/3 of the questions will be drawn from Huang and Landau textbooks, others will be drawn from lectures.

2. Problem Sets. There will be 4 problem sets, each set will have 6-10 problems and will be due in three weeks.

3. Grades Each solution will be graded on the conventional (A-F) grading system. Valid grades are A -5 points, AB - 4 points, B - 3 points, BC - 2 points, C - 1 points D - 0.5 points, and F -0 points. The total grades for mid-term exams will be based on the following scheme: A - 15-13 points, AB - 12-11 points, B - 10-9 points, BC - 8-7 points, C - below 7 points. For the final exam, the total grades will be as follows A - 25-21 points, AB - 20-18 points, B - 17-15 points, BC - 14-12 points, C - below 12 points. The final grade for the course will be based on the mid-term exams (30% each), and on the final exam (40%).

Besides, to get **A** or **AB**, one should present solutions for **all** four homesets and collect more than 66% of the maximum total number of points graded on the same system. To get **B**, one should collect more than 50% of the maximum total number of points.

4. Class attendance is required.