

PHYS S0267 / Statistical Mechanics I / Spring 2008

- **Course Description**

This graduate course introduces fundamental concepts of statistical mechanics. Topics include: random walks and emergent properties, temperature and equilibrium, phase-space dynamics and ergodicity, entropy and free energies, and quantum statistical mechanics.

- **Lectures**

Friday 13:10–16:00 in S314

- **Office Hours**

Tuesday 15:00–16:00, Wednesday 14:00–16:00; and by appointment

- **Lecturer**

Prof. Shang-Yung Wang (Office: Sa123; Ext: 3160; Email: sywang(at)mail.phys.tku.edu.tw)

- **Course Web Page**

Course information and homework assignment are available online at

<http://taos.phys.tku.edu.tw/moodle>

- **Textbook and References**

1. J. P. Sethna, *Statistical Mechanics: Entropy, Order Parameters and Complexity*, Oxford University Press, 2006 (Textbook)
 - An electronic version of the book is available on the author's **web page**, however, make sure *not* to violate the explicitly stated copyright rules concerning hard-copy printing.
 - The printed version is imported and distributed in Taiwan by the **Sci-Tech Publishing Company**.
2. S.-K. Ma, *Statistical Mechanics*, World Scientific, 1985 (Reference, on reserve in the Library)
3. R. K. Pathria, *Statistical Mechanics*, Butterworth-Heinemann, 2nd edition, 1996 (Reference, on reserve in the Library)

- **Class Attendance**

Attendance at lectures is highly recommended but not required. You are strongly encouraged to ask questions during the lectures.

- **Homework**

- *Homework is a very important part of the course.* Homework will be assigned in class on Monday, and is due the following Monday at the start of the class.

- *Do all the problems assigned, however only a portion of problems will be graded. Use A4 size paper for solutions and have them stapled together if multiple sheets are used.*
- *Late homework will not be accepted unless special permission is granted in advance – no exceptions.*
- *Discussion on homework is allowed as well as encouraged. However, you have to (i) write up your own solutions by showing your own work, and (ii) write down the names of anybody you discussed with.*
- *Plagiarism is not tolerated and will be grounds for automatic rejection of your homework.*

Plagiarism

1. a piece of writing that has been copied from someone else and is presented as being your own work
2. the act of plagiarizing; taking someone's words or ideas as if they were your own

Source: WordNet 1.6, © 1997 Princeton University

- **Midterm Exam**

To be announced

- **Final Exam**

To be announced

- **Grading**

Homework (20%), Midterm (40%), and Final (40%)

- **Plan of Lectures (tentative)**

1. What is statistical mechanics?
2. Random walks and emergent properties
3. Temperature and equilibrium
4. Phase-space dynamics and ergodicity
5. Entropy
6. Free energies
7. Quantum statistical mechanics
8. Calculation and computation (if time permitted)
9. Order parameters, broken symmetry, and topology (if time permitted)