

**Prof. Raghuv​eer Parthasarathy**  
Dept. of Physics; Univ. of Oregon  
Spring 2008

## Physics 353 – Foundations of Physics II (Statistical Mechanics, part II)

### SYLLABUS

**Note:** This syllabus is largely the same as last term's. However, be sure to read the section on the FINAL PROJECT.

#### INSTRUCTOR:

Professor Raghuv​eer Parthasarathy  
(**Par**-tha-**sa**-ra-thī)  
174 Willamette Hall  
[raghu@uoregon.edu](mailto:raghu@uoregon.edu)

#### LECTURES

MWF 11.00-11.50am, 30 Pacific Hall  
*Attendance is not required, but is strongly recommended.*

#### OFFICE HOURS

174 Willamette  
M 9-10, W 11-12, or by appointment.  
*You're strongly encouraged to come to office hours, either with specific course-related questions, or just to chat about physics, science, and other general topics.*

#### TEACHING ASSISTANT (GTF)

Yan Sang – office hours *TBA*.

**COURSE WEB SITE:** <http://physics.uoregon.edu/~raghu/Physics353Spring2008.html>

#### TOPICS AND AIMS

Building on Physics 352, Physics 353 will deal with Statistical Mechanics and

Thermodynamics – in my opinion the most important and interesting area of Physics! Statistical Mechanics deals with the properties of many-body systems – gases in stars, electrons in a metal, molecules in a soap film – searching for “simple” properties, such as Temperature, that emerge from what may seem to be exceptionally complex systems.

**Broader Aims.** We hope to develop analytical reasoning and problem solving skills. The problems encountered in this course are less transparent than those in “introductory” courses, and require, like problems in “real-life” science and engineering, deeper thinking skills that our exercises will help practice developing. A still broader aim of the entire Physics 351 series is to enable students to understand some of the issues and excitement of contemporary scientific research. You'll hopefully find that doorways to a large fraction of current-day science are now opening to you.

#### TEXTBOOKS

- *Thermal Physics*, by Charles Kittel and Herbert Kroemer (2nd ed.). The text

is required, and should be available in the bookstore and on reserve in the Science Library. Kroemer, by the way, won the Nobel Prize in Physics in 2000 for work on semiconductors.

Also on reserve:

- *Molecular Driving Forces*, by Ken Dill and Sarina Bromberg (2003) – Inspired by increasing applications of statistical mechanics to biological systems, this remarkable book teaches stat. mech. focusing almost exclusively on applications in biology and chemistry.

## GRADING

Homework – 30%;

Midterm Exam 1 – 20%;

Final Project – 15%;

Final Exam – 35%

## FINAL PROJECT + PRESENTATION

Working in groups of two, students will complete a final project that explores some topic in statistical mechanics beyond the “standard” scope of the course. Each pair of students will create a 15-20 minute presentation to be delivered to the class during the last week (“dead week”) of the quarter. I will provide further details, as well as a list of suggested topics, later in the term. Topics outside the list *are* also allowed. A decision on a topic plus a list of at least three references **must** be completed by the end of **Week 6**.

## HOMEWORK

There will be weekly problem sets – you may hand them in at the start of lecture, deliver them to the teaching assistant, place them in my Physics Department mailbox or a

box outside my office). Solutions will be posted on the web page. Except by prior arrangement, late homework will only be accepted until 24 hours after the normal deadline, and will automatically lose 50% of its score.

*The problem sets are very important – most of what you learn in this course will be absorbed as you work on them. Think about the derivation of every concept and equation. Review your lecture notes. Feel free to chat with others, but of course, the work you submit should be your own. I encourage you not to talk too much with others, but rather to mull things over in your own mind and let ideas germinate – with practice, you’ll find that your ability to think about physical concepts improves. Of course, I recommend starting the homework assignments, or at least reading them, well in advance.*

*Another suggestion: **Sleep!** Numerous studies show that sleeping helps both memory and understanding. Moreover, I myself often puzzle over questions, go to sleep, and find the answer remarkably springing to mind the next morning.*

## COLLOQUIA

The Physics Department colloquia are Thursdays at 4pm in 100 Willamette Hall. *I encourage you to attend – even if a lot goes over your head, these seminars will provide a flavor of contemporary issues in physics. Each colloquium is preceded by coffee & cookies, which all attendees are welcome to.*

**STUDENTS WITH DISABILITIES:** If there are aspects of the instruction or design of this course that result in barriers to your inclusion, please notify me as soon as possible. You are also welcome to contact Disability Services in 164 Oregon Hall, 346-1155.