

PHYSICS 353 (FOUNDATIONS OF PHYSICS III) SPRING 2023	PROFESSOR RAGHUVeer PARTHASARATHY (Par-tha-sa-ra-thē) Office: 362 Willamette Hall Email: raghu@uoregon.edu
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SYLLABUS

Welcome to Physics 353!

INSTRUCTORS AND LOGISTICAL INFORMATION

CLASS TIMES	TuTh 12:00 - 1:50 pm, Willamette Hall Room 110 There will be a quiz during the last half hour on most Thursdays.
INSTRUCTOR	Professor Raghuveer Parthasarathy (Par-tha-sa-ra-thē) Email: raghu@uoregon.edu Office: Willamette 362
TEACHING ASSISTANTS	This course has a graduate student teaching fellow (GTF): Eddie Bautista – Email: ebautis2@uoregon.edu
OFFICE HOURS	Professor Parthasarathy and Eddie Bautista will have weekly office hours: Prof. Parthasarathy: Monday 2:00-2:50 pm and Thursday 2:30-3:20pm, Willamette 362 Eddie Bautista: Wednesday 3:00-3:50 pm and Friday 12:00-12:50 pm, outside Willamette 373 Make use of office hours! Even if you don't have specific questions, feel free to drop by. <i>Office hour times may change</i> , both by request (if particular times are not good for many students) and due to scheduling conflicts that arise.
EMAIL	Email: You can certainly ask questions by email! Please address me as “Prof. Parthasarathy” in communications. <i>Recommended:</i> Cc the GTF on emails.

COURSE DESCRIPTION

TOPICS AND AIMS

Physics 352 and Physics 353 cover Statistical Mechanics and Thermodynamics. Statistical Mechanics deals with the properties of many-body systems – gases in a star, electrons in a metal, molecules in a soap film – and reveals how “simple” properties such as temperature and phases of matter emerge from seemingly overwhelming complexity. Statistical mechanics is extremely useful not only within physics, but also beyond, and we’ll see in the course connections to chemistry, biology, information theory, and more. Thermodynamics deals with thermal energy, and can be considered a topic in itself, but becomes much clearer and more powerful if thought of as a subset of statistical mechanics. Of all the “core” topics in physics (the others being mechanics, electromagnetism, and quantum mechanics), we and many others find statistical mechanics to be the most fascinating! In case you’d like to see how Physics 352-3 fit into the overall learning objectives of the Physics major, please see <https://provost.uoregon.edu/sites/provost2.uoregon.edu/files/phys-learning-outcomes.pdf>.

Other goals: We will develop reasoning and problem-solving skills. The problems encountered in this course are less transparent than those in introductory courses, and tackling them helps us practice and expand our analytic abilities. An even broader aim of the entire Physics 351-3 series is to enable students to understand some of the issues and excitement of contemporary scientific research; we’ll apply this directly in the “Colloquium” exercise for the course. You’ll hopefully find, having explored optics and statistical mechanics, that doorways to a large fraction of current-day science are open to you.

Topics

- Most of Chapters 5-8 of Schroeder, *An Introduction to Thermal Physics*, plus other topics
- “Free Energy” and its uses
- The Boltzmann Equation and probabilities
- Quantum statistics, including Bose-Einstein Condensates
- Phase transitions

COURSE MATERIALS AND COMPONENTS

CANVAS	We will be using Canvas in this course to distribute and collect course materials. Log on to canvas.uoregon.edu using your DuckID to access our class. If you have questions about accessing and using Canvas, visit
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	the Canvas support page . Canvas and Technology Support also is available by phone or live chat: 541-346-4357 livehelp.uoregon.edu
TEXTBOOK	[Required] <i>An Introduction to Thermal Physics</i> by Daniel V. Schroeder This is available free from the library at this link. Other books you might find useful: • <i>Thermal Physics</i> by Charles Kittel and Herbert Kroemer • <i>Molecular Driving Forces</i> by Ken A. Dill and Sarina Bromberg

ASSIGNMENTS AND ASSESSMENTS

HOMEWORK	Homework is perhaps the most important part of the course (though not the easiest to assess). You'll learn a lot by doing and thinking about the homework problems. There will be homework assignments approximately every week. You are encouraged to discuss the questions with others, but of course, <i>the work you submit should be your own</i>. <u>No late homework will be accepted.</u> Grading: The homework will be graded based on (i) completeness; was something attempted for each question? (30%) and (ii) correctness of one or two of the problems; we'll choose which ones to grade. Solutions will be posted; it is important to study these, especially since the homework submissions won't be thoroughly graded. Each student's lowest score will be dropped from the overall calculation of the homework grade.
QUIZZES	There will be short quizzes most weeks, on Thursdays. We'll use these to assess understanding of key points without the heavy weight of an exam. The quizzes will also revisit homework problems. Each student's lowest quiz score will be dropped from the overall total. There won't be any make-up quizzes; if you miss one, this will be the quiz dropped from your overall grade calculation.
EXAMS	There will be one midterm exam, and a final exam. Midterm Exam: tentatively scheduled for May 4. Final exam: 8:00 am Wednesday, June 14. I realize the timing of the final exam is not ideal; it's set by the Registrar, not me – https://registrar.uoregon.edu/calendars/examinations.

GRADING	The various grade components and their weights for the final grade are: • <i>Quizzes: 25%</i> • <i>Homework Assignments: 25%</i> • <i>Colloquium Report: 5%</i> • <i>Midterm Exam: 20%</i> • <i>Final Exam: 25%</i> Overall Grade: A=88-100%; B=76-87.9%; C=64-75.9%; D=55-63.9%; F<55%.
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OTHER POLICIES

ABSENCES AND ATTENDANCE	We follow the university's policies, as described at https://provost.uoregon.edu/course-attendance-and-engagement-policy. Please note the “reason neutral” absence policy: instructors “shall not ask for reasons for absences and shall not distinguish between ‘excused’ and ‘unexcused’ absences.” Attendance is not recorded, but participation points, quizzes, and exams are only implemented in class. I will not give “makeup” quizzes, etc. As noted above, I’ll drop the lowest quiz score, etc., and rescale participation scores – these will help offset absences. One of the aims of this policy to avoid the unsatisfying messes created by “makeups,” which are never equivalent to the originals. Please contact Prof. Parthasarathy if you have University-sponsored events that will require you to miss class.
ACADEMIC INTEGRITY	Students are expected to abide by university policies on academic honesty, avoiding unauthorized help on assignments and examinations, the use of sources without acknowledgment plagiarism, fabrication, and cheating of all types. The Student Conduct Code (https://dos.uoregon.edu/conduct) provides definitions of these terms and explanations of the university policy on the subject. I take academic misconduct very seriously, as it is disrespectful to your fellow students, your instructor, and society. I will report misconduct to the Office of Student Conduct and Community Standards—consequences can include failure of the course.

HOW TO DO WELL IN THE COURSE	Plan ahead and start early! This applies to everything in the course – homework, reading assignments, and general studying. It will be crucial to keep up with the course and not fall behind; later topics build on earlier ones. Homework assignments especially will require considerable time spent <i>thinking</i> – the majority of your learning will come from this. Make use of resources. If you have questions about lectures, assignments, readings, or other matters, come to Prof. Parthasarathy's or the GTFs' office hours with questions! Also, we encourage communication by phone or email, though we may often reply that it's more effective to chat in person, at office hours. <i>Also: Sleep! Many studies show that sleeping helps memory and understanding.</i>
STUDENTS WITH DISABILITIES	All of us at the University of Oregon are working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center at 541-346-1155 or uoacc@uoregon.edu.
CHANGES TO THE SYLLABUS	Course requirements, deadlines, and grading percentages are subject to change, but I will announce any changes in advance of any deadlines.