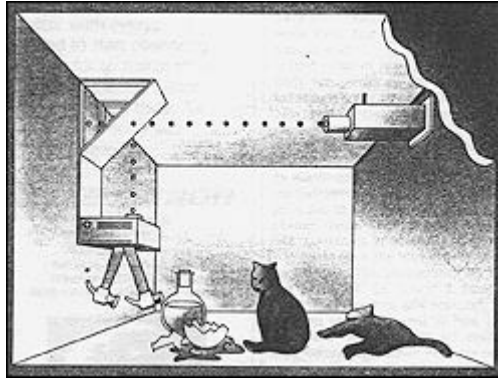


# Physics 17: Elements of Quantum Mechanics and Statistical Mechanics

Winter 2016



R. Penrose

Professor: Rahul Roy

Lecture: MWF 11 - 11:50 am; PAB 1434A

Office Hours: Knudsen 6-130M; Mondays, 1 - 3 pm

Contact: roy at ucla.edu

Enforced requisites: 1A, 1B, and 1C (or 1AH, 1BH, and 1CH), Math 32A, 32B.

Enforced co-requisite: Math 33A.

TA's: Albert Brown, albertnbrown at ucla.edu

Dominic Reiss, dominic.reiss at gmail.com

TA Office hours: Posted on CCLE

## Grading

Homework: 20%

Midterm #1: 20%

Midterm #2: 20%

Final Exam: 40%

## Homework

You are encouraged to work with your classmates, but you should not copy their work nor allow your work to be copied. That means that you must do the problems **on your own** in the end. The homework sets will form the basis for the quizzes, midterm, and final exam, which will consist of either these problems, or problems that are similar. Homeworks are due **at the beginning of class**. Late homework, defined as homework turned in after the beginning of class, will be assessed a penalty of 6 points per day. Homework will typically be worth 2-4 pts per problem, about 5-10 problems per week. Midterms will be held in class.

## **Text**

Modern Physics, 3rd Edition, by Serway, Moses, and Moyer. For statistical mechanics we will arrange access to Reif (Statistical Physics: Berkeley Physics Course, Vol. 5). *An Introduction to Thermal Physics* by Daniel Schroeder is recommended for supplementary reading.

## **Other policies**

Exams are closed book and you are not allowed to use notes unless explicitly advised that you may. Calculators are generally not allowed in exams. Please consult the University guidelines on academic integrity, which can be found at <http://www.deanofstudents.ucla.edu>

Blue books will not be necessary, since sufficient paper to complete the exams will be provided. Students will need to bring photo ID to the midterms and final exam. No makeup exams will be given; alternative grading arrangements for those who miss exams for “good” reasons (e.g. documented medical issues) will be considered. Let the professor know before the exam if you might miss the exam. Exam regrades requested more than a week after the exams are returned will not be considered. If you wish to request an accommodation due to a disability, please contact the Office for Students with Disabilities.

**You cannot pass the course without taking the final at the prescribed time.**

## **Course Content**

We will cover the introductory elements of quantum mechanics and statistical mechanics.

QM: Photons, photoelectric effect, uncertainty principle, Bohr atom, Schrödinger equation, hydrogen atom, and Gaussian and Poisson distributions.

SM: Temperature, entropy, Maxwell/Boltzmann distribution, kinetic theory of gases, laws of thermodynamics, and black body radiation.

## **Current Version of Syllabus:**

The syllabus and other material posted online is subject to revision. The most recent version will be applicable.

## Course Schedule

Due to the fast pace of our class it would benefit you to read the appropriate section in the book **before** you come to class. If you have not read the section, then you will fall behind. The reading schedule for the class is as follow (numbers refer to section numbers in Serway):

Date	Day	Topic	Reading	Due
Monday, January 04, 2016	Day 1	Introduction, review of Classical Physics and Electromagnetism		
Wednesday, January 06, 2016	Day 2	Light as an EM wave, blackbody radiation	3.1-3.2	
Friday, January 08, 2016	Day 3	Laws of Rayleigh-Means and Planck, photo-electric effect	3.3-3.5	
Monday, January 11, 2016	Day 4	Compton effect, particle wave duality	3.5-3.6	
Wednesday, January 13, 2016	Day 5	Atoms and their composition	4.1-4.2	HW 1
Friday, January 15, 2016	Day 6	The Bohr atom	4.3	
Monday, January 18, 2016	Day 7	Holiday		
Wednesday, January 20, 2016	Day 8	Bohr's correspondence principle	4.4-4.5	HW 2
Friday, January 22, 2016	Day 9	De-Broglie wavelength, Davisson-Germer Expt	5.1-5.2	
Monday, January 25, 2016	Day 10	Wave groups, Uncertainty principle	5.3-5.5	
Wednesday, January 27, 2016	Day 11	Wave particle duality, electron double slit expt.	5.6-5.8	HW 3
Friday, January 29, 2016	Day 12	Midterm #1		
Monday, February 01, 2016	Day 13	Q. Mech in 1d: Wavefunctions, Born interpretation	6.1-6.3	
Wednesday, February 03, 2016	Day 14	Particle in a box, quantum oscillator	6.4-6.6	
Friday, February 05, 2016	Day 15	Operators, expectation values and observables	6.7-6.8	HW 4
Monday, February 08, 2016	Day 16	Quantum tunneling through a square barrier	7.1-7.2	
Wednesday, February 10, 2016	Day 17	„	„	HW 5
Friday, February 12, 2016	Day 18	Q. Mech in 3d: Particle in a box, Angular momentum	8.1-8.2	
Monday, February 15, 2016	Day 19	Holiday		
Wednesday, February 17, 2016	Day 20	Quantization of Angular momentum, energy	8.3-8.4	HW 6
Friday, February 19, 2016	Day 21	Hydrogen and H-like ions	8.5-8.6	
Monday, February 22, 2016	Day 22	Midterm #2		
Wednesday, February 24, 2016	Day 23	Thermo review		
Friday, February 26, 2016	Day 24	Thermo review + probability		
Monday, February 29, 2016	Day 25	statistical ensembles		
Wednesday, March 02, 2016	Day 26	Thermal equilibrium, temperature		HW 7
Friday, March 04, 2016	Day 27	stat. mech		
Monday, March 07, 2016	Day 28	stat. mech		
Wednesday, March 09, 2016	Day 29	stat. mech		HW 8
Friday, March 11, 2016	Day 30	Review		
Friday, March 18, 2016		Final Exam		