

Physics III – Thermodynamics, Waves and Optics

Phys-UA 95

Fall 2016

Professor

Frank A. Moscatelli

Email: frank.moscatelli@nyu.edu

Office hours: M. 1 PM - 3 PM,
Tu. Anytime by appointment
Wed. 11 AM – 12 noon

Office: Meyer 703

Telephone: 212-998-7729

Teaching Assistants

Marc Williamson, email: mew488@nyu.edu

Xiaoyi Xie, email: xiaoyi.xie@nyu.edu

TA office hours are usually immediately after recitation session or by appointment.

Administration

William LePage

Email: wlp1@nyu.edu

Office: Meyer 424

Telephone 212-998-7704

Meeting Times

Lectures: M. W. 9:30 – 10:45

Recitation 002: Th. 9:30 – 10:45

Recitation 003: Tu. 3:30 – 4:45

Recitation 004: W. 4:45 – 6:10

Meyer 122

Meyer 433

Meyer 264

Meyer 425B

Course Text(s)

University Physics, 14th edition by Young and Freedman, Pearson Addison Wesley (2012). This is the same text used for Physics I and II so you already have it. We will cover chapters 14 – 20 and 32 – 36 although not in that order. Homework and exam questions will be from, and at the level of, this book, respectively.

Untitled Waves Manuscript by David Morin. The PDF version is available at <http://www.people.fas.harvard.edu/~djmorin/book.html>. Scroll down to Waves. This treatment is at a higher level, but is readable for those interested. It is also a good introduction to the methods in subsequent physics courses such as Classical and Quantum Waves, PHYS 105.

The Feynman Lectures in Physics. Also available at <http://www.feynmanlectures.info/>. This classic text has an excellent treatment of thermal and statistical physics.

Pre and Corequisites

Physics I & II with a grade of C or better or permission of the department. Calculus III (V63.0123) or Intensive Calculus II (V63.0222) can be taken concurrently with this course. We will use some basic linear algebra that we will learn as a review or new material. Physics majors must also register for Intermediate Experimental Physics I (V85.0096). This is a separate course with a one hour fifteen minute lecture and an afternoon lab.

NYU Classes

All course announcements, homework, solutions, exam dates will on the course website through NYU Classes.

Homework

Problem sets will be assigned weekly and posted on NYU Classes. They are due on Fridays at 5:00PM in a box in the Physics Office, Meyer 424. They will be graded and returned in class at a subsequent time. Solutions will be posted on NYU Classes. To get full credit, the correct answer must be given along with all work shown. Graders will award partial credit, but doing so is more difficult if your work is sloppy and/or poorly organized on the page. Neatness, although not awarded per se, works to your advantage. In calculating your homework average, we will drop your lowest grade.

Recitation

Recitation is an integral, essential part of the course. Problem solving techniques are honed by repeated practice either alone or in groups. Recitation attendance is as expected as it is for lecture. In fact, your participation in recitation is part of your overall grade. It is your responsibility to contact your TA if you cannot make a section and arrange to attend another one for that week.

Exams

There will be two in-class midterms (Wednesday Oct. 5 and Wednesday Nov. 16) as well as a final exam. The final is scheduled for Monday 19 December at 8:00 – 9:50AM in our normal lecture hall, Meyer 122. If you know you will miss an exam it is essential that you notify me as early as possible.

Grading Breakdown

Homework	25%
Recitation	10%
Midterms (both)	40%
Final	25%

Collaboration and permitted aids

Physics is often a collaborative endeavor. You are encouraged to work with your classmates on homework assignments, but you must produce your own work. You may work through a problem together on the blackboard then transcribe and condense the arguments on your individual assignments. You may not copy directly

from one assignment to another. You may explain to a classmate how you solved a problem. You may not give a classmate a copy of your homework to consult. List your collaborators on each problem set.

On homework, you may of course use any or our textbooks and lecture notes. You may not use solution sets produced for other courses or previous years of this course (e.g. that you might find online or be given by a friend). If you use any resources other than the course texts, course lecture notes, or course section notes, list them on your problem set.

Unless we tell you specifically otherwise, you may not use any aid (books, notes, calculators, etc.) on any quiz or exam. If you have any question about what is permitted, please consult the course staff.

You are also reminded of the University policy on academic honesty described in the Handbook. Instances of cheating will be referred to the Director of Undergraduate Studies with a *minimum* outcome of a failing grade in the course.

<u>Schedule of lecture topics</u> (approximate)	Reading	Other
Temperature & heat	17.0-17.5	
Phase changes & thermal transport	17.6-17.7	
Equations of state & the ideal gas law	18.0-18.3	Feynman 39
Gas velocity distribution & heat capacities	18.4-18.6	Feynman 39
First law & work, thermodynamic paths	19.0-19.4	Feynman 44-1
Adiabatic processes, specific heat ratio	19.5-19.8	Feynman 44-2
Heat engines: cyclic processes & efficiency	20.0-20.6	Feynman 44-3,4
Entropy and the second law of thermodynamics	20.7-20.8	Feynman 44-5,6
Boltzmann law & Equipartition theorem revisited		
Linear Algebra Review, midterm review		

Midterm Exam 1 Wednesday 5 October

Intro to waves, review of SHM	14.1 – 15.3	Morin1
Coupled oscillators	Morin 2	
Translational invariance, the wave equation	Morin 2	
Mechanical waves: dynamics	15.4-15.8	Morin 4
Harmonic analysis: Fourier series	Morin 3.1	
Sound: pressure waves; standing waves	16.0-16.5	Morin 5
Sound: interference; Doppler effect	16.6-16.9	
Light: EM waves, polarization	32.0-32.5	Morin 8
Light: Reflection & refraction	33.0-33.4	

Midterm Exam 2 Wednesday 16 November.

Geometric optics: spherical mirrors	34.0-34.2	
-------------------------------------	-----------	--

Geometric optics: thin lenses	34.3-34.4	
Optical devices: eye, telescope & microscope	34.5-34.8	
Interference: 2-slit & film interference	35.0-35.4	Morin 9
Fresnel & Fraunhofer: 1-slit diffraction	36.0-36.3	Morin 9
Multiple-slit diffraction & gratings	36.4-36.5	Morin 9
X-rays, holography & resolving power	36.6-36.8	

Final 19 December.

NB: Due to missing two Mondays, one on Labor day and one on October 10 (fall recess, aka Columbus Day), NYU has created a "legislative day" on Tuesday, December 13: **classes will meet according to a Monday schedule on that day**. We will, therefore, have three classes that week. M, Tu and Wed, Dec. 12, 13, 14. These will be our final classes before the Final Exam on Dec 19.