

**Physics 254 - Contemporary Physics**  
**Winter 2006**  
**Call# 05578**

**Instructor**     **Dr. Braslavsky**  
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**Text:** Physics for Scientists and Engineers, Paul A. Tipler  
5<sup>th</sup> edition 2004 Chapters 34 to 41  
Volume 2C (ISBN 0-7167-0906-6)  
Additional readings: Modern Physics  
Serway/Moses/Moyer

**Office Hrs**        Thursday 5:30-6:30 room 243C in Clippinger and By appointment

**Class meets** Mon, Tue, Th, Fri, Clippinger 133     9:10 - 10:00 p.m.

The syllabus can be found in CAPA system which will be used as a homework and communication platform: <http://loncapa.phy.ohiou.edu>

The following list of chapters will be covered in approximately the order indicated. Topics will be grouped and presented through relevant problems.

Tipler chapters in order:

- 34, Wave-Particle Duality and quantum Physics
- 35, Applications of the Schrodinger Equation
- 36, Atoms
- 37, Molecules
- 38, Solids
- 39, Relativity
- 40, Nuclear Physics
- 41, Elementary particles and the beginning of the Universe

- Nanoscience Introductory Course

The Midterm Exam will be 2 hours starting at  
6:10 p.m. room 235 in Walter hall on Wednesday February 8<sup>th</sup>

The final exam will be (as in the schedule of classes), i.e. March 14<sup>th</sup>, 8am.

Jan 3	Chapter 34: Wave-Particle Duality	Feb 13	Chapter 39
5	Wave-Particle Duality	14	Movie – relativity
6	Wave-Particle Duality	16	Chapter 39
		17	Chapter 40
Jan 9	Chapter 35: Schrodinger Equation	Feb 20	Chapter 40
10	Chapter 35	21	Chapter 40
12	Chapter 35, Problem Set 1 due	23	Problem Set 6 due
13	Quiz 1, Chapter 34	24	Quiz 5, Relativity(Ch39)
Jan 16	Martin Luther King Day	Feb 27	Chapter 41
17	Chapter 36 Atoms	28	Chapter 41
19	Chapter 36 Problem Set 2 due	Mar 2	Problem Set 7 due
20	Quiz 2, Chapter 35	3	Quiz 6, Chapter 40+41
Jan 23	Chapter 36	Mar 6	Nano Science
24	Chapter 36	7	Lab visit
26	Chapter 37, Problem Set 3 due	9	Open questions in Physics
27	Quiz 3, Chapter 36	10	Review
Jan 30	Chapter 37 Molecules	Mar 14	Final
31	Chapter 38 Solids		
Feb 2	Chapter 38, Problem Set 4 due		
3	Quiz 4, Chapter 37		
Feb 6	Chapter 38		
7	Review, Problem Set 5 due		
8	Midterm, Chapter 34 to 38, 6:10 pm		
9	Chapter 39 Relativity		
10	Chapter 39		

Grading policy

**General**

Modern Physics is a fascinating journey in which the common sense that based on human dimension and perspective is stretch to the wonders of the very small, very fast, the incredible big and the highly complex systems. The physics in the non-human dimensions found to be very different from what sought to be a direct extension of the physics known in the beginning of the century. Still, a good familiarity with the traditional physics is needed in order to study Modern Physics. Physics 254 deals with **wave-particle duality, quantum mechanics phenomena in atoms, molecules and solids, relativity and other selected topics in modern or contemporary physics**. Physics 254 is the final part of a four-quarter sequence in General Physics for students of science and engineering. It is assumed that you are familiar with all the material covered in the first three quarters. Particular topics that you will be using and may want to revise are: particle dynamics, including circular motion; wave mechanics; dynamics of charged particles and the generation of magnetic fields; electromagnetic waves.

**Grading System**

	Contribution toward the final grade
Midterm Exam	20%
Quizzes	20%
Warm-up exercises	4%
Assignments	16%
Final Exam	40%
<b>Total</b>	<b>100%</b>

**Quizzes and Exams**

**No books, notes or formulae stored in electronic or written form may be consulted during the quizzes or exams.** Students are expected to remember basic formulae and definitions. A formula sheet will be provided with the exam by the instructor. Students will need a simple "scientific" calculator such as the TI 30 X. The particular functions you will require are: the trig. functions sine, cosine and tangent (sin, cos and tan) and their inverse, e.g. arcsin,  $\sin^{-1}$  or inv sin, etc.; logarithms (log); square root; scientific notation; exponential. Students who have not used a scientific calculator before should make sure they are familiar with how to perform long calculations as well as use the above functions.

**Midterm exam**

There will be one, midterm exam that will count 20% toward the final grade. A sample question set will be posted at the web site.

**Final Exam**

The final exam is a two-hour exam and will be comprehensive.  
The final exam will count 40% toward the final grade.

**Quizzes**

Quizzes will usually be given during the second half of the classes on Thursdays. Anyone who misses a quiz will be given a makeup if they have a valid university excuse. The total quiz grade will count 20% toward the final grade.

## Physics 254 Dr. Braslavsky

### Warm-up exercise

Before each class one or more questions, posted by the instructor in CAPA, should be answered not later than an hour before the class, i.e. by 8 am. In this correspondence you are encouraged to raise points that need clarifications and remark on any subject regarding the course. Warm-ups will count 4% toward the final grade.

### Homework Assignments

The instructor will assign homework problems weekly. The homework will count 15% toward the final grade. The average grade on the homework is ~90%. There is a small correlation between the homework grade and your overall grade for the course, but it is very small. It is there to help you learn the material in preparation for the exams.

### Final Grades

The individual numerical scores will be weighted as given above and added to give a total score out of 100. Letter grades will be awarded approximately as follows:

A- to A > 89;  
B- to B+ 79 to 88;  
C- to C+ 69 to 78;  
D- to D+ 59 to 68;  
F < 58.

The bands may be adjusted down but never up. This information is given so that you can work out what you need to do to get a particular final grade. No letter grades are applied to individual parts of the course, only the numerical scores from the parts, with the weightings shown, are used to calculate the final letter grade for the course.

### Statement regarding the mathematical knowledge assumed

Students taking Physics 254 have passed MATH 263A and B and Physics 251, 252 and 253, or the equivalent courses elsewhere. These are more than just check marks in boxes. It means that you have the skills necessary to handle the math required by Physics 254. Specifically, you are expected to be fluent in the following topics:

Basic arithmetic and logical operations

Algebra of single and multiple variable equations

Graphical representation of equations

Linear Equations

Solution of simultaneous equations with 2 or 3 variables

Trigonometric functions, their definitions, properties and associated identities

Logarithmic and exponential function properties

Differentiation of simple functions, e.g.  $x$ ,  $x^2$ ,  $x^{-1/2}$ ,  $\log x$ ,  $\sin x$

Integration of simple functions, e.g.  $x$ ,  $x^2$ ,  $x^{-1/2}$ ,  $x^{-1}$ ,  $\sin x$

Vector addition and subtraction, vector multiplication, both dot and cross products

You should also be familiar with methods of solving differential equations.