

SYLLABUS

PHYSICS 1500

Section 001

Fall 2003

VILLANOVA UNIVERSITY

Department of Physics

Dr. Javad Siah

TEXT BOOK:

1. NEWTON to EINSTEIN - the trail of light
Author: Ralph Baierlein
(Cambridge University Press, 2001 edition)
2. Additional power-point presentation/summary files

OBJECTIVE: The main goal of this course is to provide instructions for the understanding of Light. Throughout the semester the students are familiarized with our evolving views of the nature of light during the past four centuries.

This course is different from the more traditional general survey type physics courses in the fact that it is built around a small number of ideas. Following the trail of light we become familiar with the wave – particle duality of nature and learn about the relativity of time and space. We learn how light could be regarded as a link between the two independent components of space and time. We will see how the two ideas of duality and relativity have changed our world views and shown how our intuition about nature may sometimes be wrong.

In discussing the concept of light, I will demonstrate the nature of scientific methods and theories. We will see how inductive reasoning in science shapes our observations and generalizations into powerful tools called physical laws.

Language of science is mathematics, and it is not possible to fully appreciate science without it. Throughout the course the usefulness of mathematics, even at the high school level, is demonstrated through the analysis of some quantitative problems.

In our modern world, operation of a significant number of business endeavors depend on the working of computers, electronic devices and gadgets. Invention and development of many if not all of these devices would have been impossible without advancement in our understanding and technological manipulation of the behavior of light. In any foreseeable future, it is hardly possible to envision advances in any segment of economy without the related advances in the ‘Optical’ technologies. I will qualitatively analyze the working of some of the commonly used devices.

Finally, my hope is for the student to come out of a semester of hard work with a sense of ease and appreciation for the scientific ideas presented to him/her in books and other media.

FORMAT: The Monday and Wednesday classes are in distance learning format (no classes). During the Friday sessions no new material will be taught these classes are used for demonstrations, recitations and in-class tests.

REQUIREMENTS: This is a non-calculus based course, however a working knowledge(at high school level) of algebra and geometry is required to follow the lectures. Twelve chapters of the assigned text book is covered. Material covered in the text are supplemented with power point presentation/summary files.

ATTENDANCE: No in-class attendance is required on Monday and Wednesday sessions. However, I will be in my office and on line in the general chat room during the class times. You can communicate with each other or as groups in the chat rooms of WEBCT. A record of your communications with me is kept and it will improve your grades.

GRADING: There are four tests and 11 homeworks. Each homework has a deadline. Late homeworks are accepted but with penalty. It is essential that you submit your homeworks. Most of the homework grade is given for the work and the thought that you put into answering them. Each test is worth 100 points. All

of the homeworks together is worth 100 points. The fourth test during the finals is accumulative, but it only summarizes the material covered under the first three test.

COMMUNICATIONS: All of your written communications with me should be conducted through communication tools(Mail, Discussions and the Chat) of WEBCT. Please take a tutorial tour of the WEBCT before the summer session to become familiar with its capabilities. You should submit your homeworks in form of Microsoft Word attachments to your mail. Please familiarize yourself with creation of simple graphics and insertion of formulas in Microsoft Word.

MAKE UP: There is no make up for a missed test or homework.

Course Material

- I. A historical perspective
- II. How light behaves
Sections:1 - 6
- IV. Newton's particle theory
Sections:1 - 6
- V. A Wave theory of light
Sections:1 - 5
- IV. Interference
Sections:1 - 8
- VII. Electromagnetic waves
Sections:1 - 9
- VIII. The photon
Sections:1 - 5
- IX. The wave-particle duality
Sections:1 - 5
- X. The principles of the Special Theory of Relativity
Sections:8.1 - 9.7
- XI. Time dilation and length contraction
Sections:1 - 7
- XII. $E = mc^2$
Sections:1 - 10
- XIII. The twins
Sections:1 - 3

Tentative Chapter coverage, Test and Homework (HW)

Date	chapters	
8/25 - 9/5	1	
9/8	HW - 1	
9/8 - 9/17	2	
9/17	HW - 2	
9/17 - 9/24	3	
9/24	HW - 3	
9/26	1st Test: Chapters; (1,2,3)	100 points
9/26 - 10/6	4	
10/6	HW - 4	
10/6 - 10/9	5	
10/9	HW - 5	
10/9 - 10/22	6	
10/22	HW - 6	
10/22 - 10/29	7	
10/29	HW - 7	
10/31	2nd Test: Chapters; (4,5,6,7)	100 points
10/31 - 11/5	8	
11/5	HW - 8	
11/5 - 11/12	9	
11/12	HW - 9	
11/12 - 11/19	10	
11/19	HW - 10	
11/19 - 12/1	11	
12/1	HW - 11	
12/1 - 12/4	12	

12/4

HW - 12

12/5

3rd Test: Chapters; (8,9,10,11) 100 points

To be announced

4th Test: Chapters; (1 - 12) 100 points

The format of the questions on the tests is: *Problems, Essays (discussion) and Multiple Choices. The questions will cover all the material covered ed in the required text book. The questions are similar, but not identical to the assigned homework problems and the questions at the end of each chapter.*

Office: Mendel - Room 263 B

Office Hours: M & W: 11:30 - 12:30 - I'll try to stay in the chat room. T & F: 12:30 - 1:30

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