PHY 240 Introduction to Modern Physics
Spring 2015

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TEXT: *Modern Physics*, 3rd edition, Kenneth Krane (2012).

SPRING SEMESTER SCHEDULE

20 Jan	8 a.m.	Tues	University classes begin
20 Jan	9:30 a.m.	Tues	First PHY 240 class
10 Feb	9:30 a.m.	Thurs	***First Hour Exam***
9-13 Mar		Mon-Fri	Spring Break – No classes
19 Mar	9:30 a.m.	Thurs	***Second Hour Exam***
14 Apr	9:30 a.m.	Tues	***Third Hour Exam***
30 Apr	9:30 a.m.	Thurs	Last PHY 240 class
4 May		Mon	Last day of classes
7 May	8 a.m.	Thurs	***Final Exam***

COURSE GOALS, DIRECTION AND OBJECTIVES

In this course we will examine the empirical basis for modern Physics. The physical phenomena discovered and investigated in the late 1800s proved intractable to analysis with the tools developed in classical Physics. Entirely new approaches arose to synthesize the results of experiments. The special and general theories of relativity together with quantum theory tie together phenomena from the atomic scale to the grandest in the cosmos. We shall also examine applications of the fundamental phenomena we discuss.

Throughout this course, we will develop many mathematical tools and techniques to aid us in the description of physical systems. We will continue to systematically develop problem-solving skills, an important requisite in the critical and logical analysis of the physical world. Our goal is to be able to identify which physical principles are useful in understanding a particular physical system and to use those principles to obtain experimentally verifiable information about it.

COURSE CONTENT AND SYLLABUS

Date	***Reading***	***Topic***
20 Jan	Chapter 1, pp 1-21	Introduction and review of classical physics
22	Chapter 2, pp 25-40	Special relativity
27	Chapter 2, pp 40-47	Special relativity

29	Chapter 2, pp 47-62	Special relativity
3 Feb	Chapter 3, pp 69-80	Particle-like properties of EM radiation
5	Chapter 3, pp 80-96	Particle-like properties of EM radiation
10	***Exam 1***	***Chapters 1-3***
12	Chapter 4, pp 101-110	Wave-like properties of EM radiation
17	Chapter 4, pp 110-119	Wave-like properties of EM radiation
19	Chapter 4, pp 119-128	Wave-like properties of EM radiation
24	… catch a breath	
26	Chapter 5, pp 133-143	The Schrödinger equation
3 Mar	Chapter 5, pp 144-154	The Schrödinger equation
5	Chapter 5, pp 155-165	The Schrödinger equation
Spring Break		
17	Chapter 6, pp 169-180	The Rutherford-Bohr model of the atom
19	***Exam 2***	***Chapters 4-5***
24	Chapter 6, pp 180-193	The Rutherford-Bohr model of the atom
26	Chapter 7, pp 197-210	Hydrogen atom in wave mechanics
31	Chapter 7, pp 210-221	Hydrogen atom in wave mechanics
2 Apr	Chapter 8, pp 225-240	Many-electron atoms
7	Chapter 8, pp 240-252	Many-electron atoms
9	Chapter 12, pp 369-387	Nuclear structure and radioactivity
14	***Exam 3***	***Chapters 6-8***
16	Chapter 12, pp 387-401	Nuclear structure and radioactivity
21	Chapter 13, pp 407-422	Nuclear reactions and applications
23	Chapter 13, pp 422-436	Nuclear reactions and applications
28	Chapter 14, pp 441-458	Elementary particles
30	Chapter 14, pp 458-473	Elementary particles
8 May	***Final Exam, 8 – 10 a.m.***	***Cumulative***

PROBLEM ASSIGNMENTS

Due dates for the assigned problems will be announced in class. The submission of solutions to assigned problems is required. Solutions will be evaluated, but no letter grade will be given. Solutions consisting of disembodied equations without expository text are unacceptable. Discussions concerning the problems and their solutions are encouraged among the members of the class and between the class and the instructor. As students transitioning out of the introductory physics course sequence, you undoubtedly and keenly know the importance of completing the assigned problems (which should be viewed as a minimum assignment). As a guide to the proper elements of a solution, you can find below a document prepared by Dr. Caler that lists criteria for quality. The submitted solutions must ultimately be the work of each individual. [Appropriate acknowledgement, of course, of contributions made by classmates or the instructor is expected.] Solutions to homework problems will be made available at the course web site after they are due.

Chapter 1: 1, 4, 5, 7, 8, 10, 13, 15, 16.
Chapter 2: 1, 2, 5, 6-8, 11, 12, 15, 17, 18, 20-22, 25-29, 33, 34, 36, 38, 39, 41, 43, 45
Chapter 3: 1-3, 5-9, 15, 16, 18, 19, 21, 23, 25, 26-30, 32 also add part c to 32: c) How far away must the light bulb be placed so that 5 photons per second enter the pupil of a human eye 0.6 cm in diameter? Also do problems 33 and 35.
Chapter 4: 1-3, 5, 7, 10, 12, 15, 17-21, 28, 29, 37
Chapter 5: 3-7, 9, 11, 13, 14, 17, 20-22, 27.
Chapter 6: 1, 2, 5-8, 12, 15, 18, 19, 21, 23, 26, 28-31, 33, 34
Chapter 7: 1-6, 8, 10, 12, 14, 15, 18, 21, 25, 26
Chapter 8: 1, 4-6, 8, 12, 13, 15, 19
Chapter 12: 1, 3-5, 7, 9-11, 14, 15, 18, 22, 24, 25, 27, 32
Chapter 13: 1-3, 5, 7, 10, 13, 17, 19, 22, 25, 26
Chapter 14: 1-4, 6-8, 11, 12, 15, 21, 23, 25

FINAL GRADE

Your final grade will be based on the instructor's evaluation of the work you submit in connection with this course and your participation during class sessions.

COURSE POLICIES

Attendance: Attendance in all class sessions is mandatory.

Academic Integrity: All graded work is to be done by the student receiving the grade. Plagiarized or academically dishonest work may receive zero credit, may result in a failure of the class, and potentially suspension or expulsion from the university. If you have any questions concerning what is or is not considered a violation, please see the instructor *before* you decide to act and please consult the Undergraduate Student Academic Integrity Policy. It is your responsibility to know what is considered academic dishonesty.

Learning Disabilities: In order to request academic accommodations due to a disability, please contact the Office of Services for Students with Disabilities (OSSD) at (610) 436-3217. If you have a letter from their office indicating that you have a disability that requires alternative academic accommodations, please present the letter to one of the instructors *in advance* of any assessments so we can discuss the accommodations that you might need in this class. We share the University's desire to comply with the ADA of 1990.

Public Safety Emergency Contact Number: The Emergency Communication Committee has made the recommendation that the emergency phone number for WCU's Department of Public Safety be listed on all course syllabi. That number is **610-436-3311**. This specific recommendation is made to help the campus be prepared in case of an emergency situation.

Intellectual Property Statement: The instructor for this course utilizes copyrighted materials under the "Freedom and Innovation Revitalizing United States Entrepreneurship Act of 2007" (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated

with this course is owned and copyright protected by the instructor, including, but not limited to, course notes and discussions, supplementary materials posted or provided to students, assessment instruments such as quizzes and exams, and Power Point presentations. No recording, copying, storage in a retrieval system, or dissemination in any form, whether electronic or other format, by any means of the intellectual property of the instructor, either in whole or in part, is permitted without the prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals in the semester in which this course is held. Links and references to on-line resources provided by the instructor may lead to other sites. The instructor does not sponsor, endorse or otherwise approve of any information appearing in those sites, nor are they responsible for the availability of, or the content located on or through, external sites. Apart from materials used in accordance with the Fair Use Act, the instructor takes no responsibility for material that is otherwise offered at web sites and makes no warranty that such material does not infringe any third party rights. However, should any of this type of material be present and this fact is brought to the attention of the instructor, references to it will be removed from course materials.

Information on General Policies: For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department's Handbook for Physics Majors, the Undergraduate Course Catalogue, the Rams Eye View, and the University Web Site. Please understand that improper conduct in any of these areas will not be tolerated and may result in immediate ejection from the class.

PHY 300 Dr. Caler Fall 2013

HOMEWORK GRADING RUBRIC

The below criteria apply to problems seeking a numerical answer as well as those that require a proof or an illustration.

Grading Criteria	Point Value[1]
• The problem is properly set up • Your methodology is clear and it is correct • Expository text guides the reader through the problem • Your math is correct, or contains a minor algebraic error • The result is correct, or contains a minor algebraic error • All collaborators are cited	5 points
• The problem is properly set up • Your methodology is clear, but it contains a major error • Expository text guides the reader through the problem • Your math is consistent with your methodology error, or has a minor algebraic problem • The result is not correct • All collaborators are cited	4 points
• The problem is properly set up • Your methodology is not clear, but it seems to be correct • No expository text exists • Your math seems to be correct, or seems to contain a minor algebraic error • The result is correct, or contains a minor algebraic error • No collaborators are cited	3 points
• The problem is properly set up • Your methodology is clear, but contains more than one major error • Expository text guides the reader through the problem • You have several math errors • The result is not correct • All collaborators are cited	2 points
• You made an attempt to set the problem up • Your methodology is not clear, and it appears to contain at least one major error • No expository text exists • You have several math errors, or your math ends abruptly • The result is incorrect or unclear • No collaborators are cited	1 point
• You have not done the problem, or what you have submitted is meaningless or indecipherable[2]	0 points

1: If the problem is a multiple-part problem, the below grading criteria will be applied to each individual part; however, the point values will be scaled such that the entire problem is worth a maximum of 5 points.

2: Work that cannot be ***easily*** read will not be graded.