ELEMENTS OF PHYSICAL SCIENCE—PHY 100-01—SPRING, 2014

MWF 9:00-9:50 am, Rm. Merion 109

Instructor: Dr. David E. Chyba

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—Office Hours (starting second week)—

MTWF, 11:00 am-12:00 noon, and Thu., 2:00 pm-3:00 pm

-Also by appointment. Occasional cancellations of office hours are likely-

Texts and Other Supplies—*Two books are required:*

- (1) *Newton to Einstein: The Trail of Light* (An excursion to the wave-particle duality and the Special Theory of Relativity), by Ralph Baierlein (Cambridge and New York: Cambridge University Press, 2001). ISBN-13: 978-0-5214-2323-6; ISBN-10: 0-5214-2323-6 (paper).
- (2) Physics for Future Presidents: The Science Behind the Headlines by Richard A. Muller (New York: W. W. Norton & Company, 2008; paperback: September, 2009). ISBN-13: 978-0-393-33711-2; ISBN-10: 0-393-33711-1 (paper).

Additional Item(s) Needed: A stand-alone "scientific" calculator with trigonometric functions (specifically, the sine function and its inverse). The essential feature of a scientific calculator is a provision for directly entering numbers in scientific notation (usually a key or its " 2^{nd} function" labeled "EE" or "EXP"). I recommend the Texas Instruments TI-30Xa as an inexpensive and easy-to-use calculator having the necessary basic features. (A graphing calculator is *not* necessary.) Note that a calculator which is part of an iPhone, iPad, or other electronic device is *not* allowed to be used for test-taking; only a stand-alone calculator may be used for taking a test, quiz, or exam.

A straight-edge will be helpful for making drawings in homework and in lecture notes.

Comments on the textbooks:

Both books listed above are required. Both are paperbound. Text (1) is the primary textbook. Text (2) is very readable. It describes the significance of physics for important contemporary government policy issues: terrorism, energy in general, nuclear energy, space exploration, and climate change. It is written for the non-scientist, and could be called "physics for informed citizens". I will provide a format for reporting on this book at the start of the semester. The report is due about a month before the end of the semester.

Description of this Version of Physics 100: An introductory one-term course emphasizing three themes: understanding the nature of light; the relation of the study of light to other areas of physics; and the history of these ideas. The course develops these themes by following "the trail of light" through the history of physics. This trail leads through three or four major landmarks in our understanding of Nature which are treated in the course—light as an *electromagnetic* phenomenon and the reality of the *electromagnetic field*; the *wave-particle duality* of quantum mechanics; and Einstein's *Special Theory of Relativity*. The relation of physics to "science literacy" and to government policy is addressed through the supplemental reading. The mathematics required for the course is basic algebra and geometry. A small amount of trigonometry (the sine function) will be introduced and explained for limited use.

West Chester University General Education Goals: This course strives to have students meet the following general education goals: (1) Ability to communicate effectively; (2) ability to employ quantitative concepts and mathematical methods; (3) ability to think critically and analytically.

Grading: I tentatively plan to grade on approximately the following basis: semester exams, 30–45% of the total grade; final exam, 10–20%; homework assignments, including possible in-class exercises, 20–30%; report on the supplemental reading (one book), 20–30%. All semester exams included in the average will count equally. I may "curve" particular exams *if* I think that is appropriate. Final numerical scores will be converted to letter grades more or less according to the following scheme, but I may adjust my letter grade cut-offs based on how the class does and on how difficult I perceive the course to have been. Typical, possibly approximate, point-score to letter-grade conversions are: 93–100, A; 90–92, A–; 80–89, B–, B, B+; 70–79, C–, C, C+; 60–69, D–, D, D+; 59 and below, F.

Exams: There will be 3 (*possibly* 4) exams during the semester, in addition to the final exam. The final exam will be given 8:00–10:00 am Wednesday, May 7, 2014. I have not yet decided whether the final exam will be comprehensive.

Make-up Exams: I am willing to allow make-up of semester exams for sufficiently good reasons, such as illness or emergency. *The following rules apply to semester make-up exams:*

IMPORTANT: To limit possible abuse of the make-up exam privilege, I will REQUIRE the following:

- I must be notified in person, by telephone, or by e-mail by the day after the semester exam, if you need to miss the exam for any reason.
- The make-up exam must normally be taken not later than five days from the exam date. Exceptions will be made only for truly serious reasons, such as extended illness, and must be explicitly granted by me.

If you miss an exam without making it up in time and without an exemption from me, your grade for that exam will be zero. Missing the *final exam* will result in a zero for the exam unless extreme circumstances apply.

Tentative Course Calendar:

| Week No. | Starts on Monday, | Coursework, Exams, and Other Events |
|-------------|----------------------|--|
| 1 | Jan. 20 | Monday, Jan. 20, is Martin Luther King Day; classes were to start Tue., Jan. 21. Due to snow, Fri., Jan. 24 is date of first class for this course. Format for report on supplemental reading handed out. Possibly start Chap. 1 of text. |
| 2 | Jan. 27 | Chap. 1—Reflection, refraction, reversibility. Snell's Law. Homework assigned. |
| 3 | Feb. 3 | More on Snell's Law; velocity of light; colors. Finish Chap. 1. Gloss over Chap. 2; begin Chap. 3 on waves. Homework assigned. Practice Exam I given out. |
| 4 | Feb. 10 | Chap. 3 on waves. Possible homework assignment. Exam I on Chap. 1 probably on Friday, Feb. 14. |
| 5 | Feb. 17 | Finish Chap. 3 on waves. Possible in-class exercise and/or homework assignment. Possibly begin Chap. 4 on interference. |
| 6 | Feb. 24 | Chap. 4—Interference. Homework assigned. |
| 7 | Mar. 3 | Finish Chap. 4 on interference. Practice Exam II given out. |
| 8 | Mar. 10 | Exam II —Wed., Mar 12 or Fri., Mar. 14. Start Chapter 5—Electromagnetic waves. |
| | [Sem | nester Break: Week of Monday, March 17] |
| 9 | Mar. 24 | Chap. 5—Electromagnetic waves and polarization. Homework? |
| 10 | Mar. 31 | Chap. 6—Photoelectric Effect, Compton Effect, photon concept. Homework? |

(cont'd)

| Week No. | Starts on Monday, | Coursework, Exams, and Other Events |
|-------------|----------------------|--|
| 11 | Apr. 7 | Book reports due Mon., April 7. Penalty if turned in after Friday, April 11. Chapter 7—Wave-particle duality; possible related topic. Practice Exam III given out. |
| 12 | Apr. 14 | Exam III—Wed., Apr. 16. Begin special theory of relativity Fri., Apr. 18 (Chaps. 8, 9). |
| 13 | Apr. 21 | Special theory of relativity—topics from Chaps. 9, 10. Homework assigned. |
| 14 | Apr. 28 | Special theory of relativity—topics from Chaps. 10, 12, 13. Practice final exam given out. |
| 15 | May 5 | Mon. May 5 is last day of classes. We will review for the final exam. Final Exam for this course will be 8:00–10:00 am, Wed. May 7. (Final Exam Period will be Tue. May 6–Fri. May 9.) |

ADDITIONAL NOTES:

You, Me, and the Course: You are responsible for spending the "time on task" to do the work you need to do for this course. A teacher can encourage "active learning," but in the last analysis, active learning must be done by the student. If thinking of the entire semester at once is burdensome, focus on the current material!

I do not expect to provide "extra credit" work late in the semester. If you are tempted to hope for or rely upon "extra credit work" to pull you through, think of the current course material as your extra credit work as we go through the semester. I do understand that there may be many demands on your time, and I will try to be understanding and flexible. For grades to be meaningful as indicators of student performance, however, they must be based primarily on mastery of the course material and assignments, secondarily on effort made to achieve mastery, and, perhaps, thirdly on other factors.

I am very willing to provide help and explanations inside and outside the classroom (see "Office Hours" in the header information on page one). Whether you are a recent high-school graduate or working on starting a second (or third!) career, I'm interested in you. Students have found me to be very helpful in one-on-one and small group situations, so walk in or make an appointment to see me if you need help.

Disability and Special Needs: If you have a physical disability, learning disability, test anxiety, etc., please contact the Office of Services for Students with Disabilities at extension 3217 and bring the resulting documentation to me to discuss how the university and I can assist you. Note that sufficient notice is needed in order to make accommodations possible.

Tutoring: Tutoring for PHY 100 is offered by the Learning Assistance Center (LARC), 223 Lawrence Center, x2535. More information is available at: http://www.wcupa.edu/ussss/larc/ . LARC tutoring is free of charge, but you must sign up at the beginning of the semester. Peer tutoring may also be offered by physics majors during the semester.

Electronics in the Classroom: Please turn off all cell phones, iPods, iPads, iPhones, Kindles, laptops, etc., before class. If you are expecting to receive an emergency call, set your cell phone to vibrate mode and answer the call outside the classroom. You are not allowed to use cell phones for texting or gaming during class; these activities are distracting to your classmates and to the instructor. Repeated violations of these rules may be penalized.

Possible exceptions may include use of an electronic device as an accommodation for a disability or if a student has an e-copy of the textbook. These situations should be discussed with me on an individual basis.

Recording in Class: You must obtain permission from me before recording class. Video recording requires permission of your classmates as well. Any on-line posting of such recordings, or circulation of such recordings to people not enrolled in the course, is *forbidden*, unless *additional special permission* is granted.

Academic Integrity: It is the responsibility of each student to adhere to the University's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in automatic failure and removal from this course.

For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the Undergraduate Course Catalogue, the Rams Eye View, or 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.

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, lectures, course discussions, course notes and supplementary materials posted or provided to students authored by the instructor, 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 is the instructor 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 on 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, they will remove references to it from course materials.

Public Safety: The Emergency Communications Committee recommends that the number of WCU's Department of public safety be available on every course syllabus.

WCU Department of Public Safety: (610) 436-3311.