Modern Physics (SL), PHYS 3013, Section 01, 9:30am TTh, Fall 2009

Prerequisite: PHYS 1214 (General Physics II) or 2225 (Engr Physics II)

2. Dr. Karen Williams

Office: P&ES 208 **Office hrs:** 9-9:50 & 1-2 MWF, 1-2 T, 9:30-11 R
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3. Course/Section Requirements

Text: Modern Physics for Scientists and Engineers, 2nd Ed., Taylor & Zafiratos & Dubson, Prentice-Hall, 2004. (ISBN: 0-13-805715-X)

*Material from the Internet will be used as well as simulation software.
http://wps.aw.com/aw_young_physics_11/13/3510/898597.cw/index.html
*A scientific calculator will be required.

Attendance:
Attendance is highly recommended as due dates, exams, etc. listed on the syllabus are tentative and may be subject to change. Success = k * Attendance + k'*Effort + k''*Homework Completed.

4a. Student Outcomes for Gen. Education- n/a since not gen. ed course

4b. Course Objective:

The student will learn the fundamentals of modern physics as well as to be knowledgeable about its development. Specifically, the student will be able to recognize the improvements or developments of theory as new theories replace old ones. The student must be able to successfully interpret, understand, and apply relativistic physics to problems given on exams. The student must be able to successfully identify the differences between atoms, molecules, and ions. The student must be able to successfully implement these definitions and general physics knowledge into quantum theory. Furthermore, students must be able to perform derivations, provide explanations, interpret and solve problems associated with each of the topics described in the course description. Derivations (requiring algebra and basic calculus and understanding of statistical probability) are an important part of the course in that one who understands and can complete a derivation understands the criteria for use, the knowledge present for a derivation, and the limitations of an equation. Successful completion of these items will be assessed by chapter exam questions, problems, and derivations. Students will also learn how to get and critique scientific information from the Internet. This will be assessed by Internet assignments. Students will also perform service or experiential learning and complete one activity and reflection.

4c. Course Competencies (for OK/NCATE Accredited Program Courses ONLY).
4c.2). Identify the OK/NCATE Subject Area Competencies to be addressed in this course.
1a. Know and understand the major concepts and principles of the teaching discipline(s) as defined by state and national standards of the science education community.
1b. Know and understand major concepts and principles unifying science disciplines. (See National Science Education Standard Unifying Concepts).
3.a. Know and understand scientific inquiry and its relationship to the development of scientific knowledge. (this item will be assessed by various questions selected on each exam).

5. Topical Outline of Course: The quantum theory will be examined in detail. Topics include: atoms, molecules, Thompson's experiment, Millikan's Oil Drop experiment, Rutherford's gold foil experiment, Planck's idea of quantization, the photoelectric effect, Bragg Diffraction, formation of x-rays, the Compton effect, and the idea of wave/particle duality, atomic spectra, the spectra of the Hydrogen atom, Bohr's theory of the H-atom, DeBroglie's wave hypothesis, quantum wave introduction, and the uncertainty principle. Other topics include Einstein's relativity, radioactivity, and nuclear reactions.

Outline: Exam 1: Ch. 1-2 Exam 2: Ch. 3-4
Exam 3: Ch. 5-6-7 Final: Ch. 13, 17, 18
Final: Phys Dept Assessment (extra credit)

6. Grades:

Homework.

*I will randomly choose problems from the assigned homework problems to grade.
*Homework sets must be stapled with the problems in numerical order or points will be deducted.
*Please don't staple so that the problem #'s are hidden.
*Each chapter assignment will be worth a maximum of 20 points.
*No late papers will be accepted.
*Any evidence of cheating, copying, or plagiarizing on a homework assignment will result in a zero on that item. Please read the ECU Academic Integrity Policy.

Internet Assignment.

* One Internet assignment (worth 15 pts each) will be turned in over Ch 13 or 18 material. Summarize the site, critique the material (accurate? grade level written for, simulations?)
*No late papers will be accepted.
*You may look at various url's on physics web page to get you started surfing.
**Each assignment must be on material for those chapters being tested over.*
*You must have at least two url's for each assignment.
*Paper should contain the url, a summary, and a critique telling me what you learned from that site and how useful it was to you (i.e. too technical, not technical enough, etc, incorrect info, good animation, good graphics, etc.)

Experiential Learning = Service Learning (SL).

Service learning was required at ECU in order to have students learn to work with others and learn content in their field in ways that are not experienced in the traditional course. Service learning teaches teamwork,, self-esteem, content knowledge and benefits of reflection as well as providing the solution to a problem in the community. SL or Experiential Learning is a requirement to Pass the course. Failure to complete this component of service learning at ECU means you fail the course no matter what your grade is in the course since it is a graduation requirement for some. You must do the activities and write well enough on the reflections to pass the experiential learning component of this class.

(Course Content) The service experience relates to the subject matter of the course. Remember, credit is given for the learning and its relation to the course, **not for the service alone**. However, the service opportunities should be focused on the development of the civic education of students even though they may also be focused on career preparation.

Students will have 3 university approved options as far as projects from which to choose.
(FYI-Optics is also a SL course, the options for that course are tutoring, astronomy lab assistant ,or demo show)

Option 1: TUTORING

Activity Component: Students may tutor GPI and GPII students 2 hrs per week (@ 15 wks) for 30 total hours. They must have tutored 15 hours total, so if no one comes to tutoring, you must make alternate time arrangements to tutor. You might want to tutor just before exams. Student tutors (in Modern Physics) must partner with the ECU faculty teaching the lecture courses, on occasion the faculty teaching the lab courses (if help in prelab assignments is requested) and spend most of their time aiding the GPI and GPII ECU students that come for tutoring. The community of Modern Physics students serve the community of GPI/II students.

Reflection Components:

I will require the students complete an online journal each week in which which labs or tutoring sessions the students assisted with or held would complete, the questions asked by GPI/II students (or lab students), and any problems/questions about which the student was unsure. The student then would look up the answers or get faculty assistance and explain why s/he was wrong or unsure in the answer. The student would relate the material in the GPI/GPII lecture or lab to the material or topics covered in the Modern Physics class. The student is free to suggest ways in which s/he would teach the concept in the future.

The student will also at the end of the activity write a one page paper reflecting upon what s/he has gained from doing the activity. They will reflect on: physics content, questions asked by students, methods used to convey the content, their experience and what they were feeling doing the SL activity, and the experience of those who are receiving the tutoring.
Would s/he do it again if s/he had it to do over again?
Did s/he see any benefit of the activity for the students being tutored?
How did you feel doing tutoring?

Option 2: LAB ASSISTANT

Activity: Students may assist in 8 GPI or GPII physics labs. They will help answer questions in lab, help set up equipment. Students will assist GPI and GPII students with equipment in lab, calculations, measurements. Students will partner with the lab instructors to see that the lab goes as planned but mostly will interact with individual ECU students in the lab.

Reflection Component same as Option 1.

Option 3: *RADIATION/RADON MEASUREMENTS*

A. Students may do in-home radon/radiation testing for homes with granite countertops. They will learn how to operate the meters, learn hazardous radiation levels, and write a report for each home. At least 3 homes/businesses must be done.

B. Researchers have found that many granite countertops contain too high levels of radiation. Homeowners may be uncomfortable by this and want their homes to be tested. Learning to test using two meters is a valuable skill in physics. Learning to read and interpret federal guidelines is also a valuable skill.

C. Students will find homes that volunteer to have their homes tested with two meters. Results of the home testing will be written into a report given to the homeowner and Dr. Williams. The students must interact with the homeowner and the instructor of the course. The report must list all conditions of the test and all data and how (from what source) you learned how to test for each radiation.

EXAMS
*Cheating on an exam will result in an "F" in this course if the incident occurs after the drop date. If the incident occurs before the drop date a grade of zero will be given for that exam.

*40% of your points earned on The ECU Physics Assessment Exam counts as extra credit in this course. The ECU Physics Assessment Exam is required for graduation.

GRADING SCALE

*Your final grade will be calculated by adding your scores on the exams, your Internet assignment, and your homework assignments and dividing by the points possible for these items.
Note NO EXAMS are dropped. SL must be completed or an F will be given.
However, exceptional reflections (thorough, no spelling or conceptual errors, none done back-dated or all at once) will receive 20 extra points. Average reflections will receive 10 extra points.

After multiplying by a hundred to obtain a percentage, your grade will be found on the following scale: 93-100% A, 85-92% B, 77- 84% C, 65-76% D, 0- 64% F

*If you don't want your grade posted by student number, tell me. I will also post grades after exams at : http://homepage.mac.com/kwillims/NewCoursepage.html.
*Your continued enrollment in this class constitutes your acceptance of these policies.

7. ADA Voluntary Self-Identification Policy:
East Central University is committed to providing equal access to University programs and services for all students. Under university policy and federal and state laws, students with documented disabilities are entitled to reasonable accommodations. If any member of the class has a documented disability requiring academic accommodations, he or she should report to the Office of Disability Services. A student seeking reasonable accommodations originating from a documented disability must register with the Office of Disability Services so that said accommodations may be provided. Contact the Academic Affairs Office if any assistance is needed in this process.

8. Writing Proficiency Policy:
In keeping with the university's emphasis on writing proficiency, all student produced writing will be expected to reflect clear content, coherent and organized structure, and adherence to stylistic and mechanical standards articulated by the professor.

Important Dates:

Sept. 7 Labor Day Holiday	Nov. 25-27 Thanksgiving Holiday
Oct 15-16 Fall Break Holiday	Oct 30-31 Physics Reunion/ECU Centennial Homecoming!
Nov. 4 Last day drop with W	Nov. 30 Last day to drop

Modern Physics Assignments Fall 2009

Homework Assignments:	**due date:**
Ch. 1 #derive N phase difference, 1, 12, 14, 17, 19, 20, 21, 23, 24, 26, 27, 29, 33, 35, 37, 39, 41, 45	9/ 1 T
Ch. 2 #1, 7-10, 13, 16-19, 21-25, 33, 34, 44	9/8 T
Test Ch 1 & 2	**9/10 R**
Ch. 3 # 3, 5, 8, 12, 15, 19, 21, 40,41, 44, 45 No class 24th ... do photoelectric effect simulation handout	9/25 * Fri.
Photoelectric effect simulation handout	9/29 T
Ch. 4 #5, 12, 13, 14a, 18-23, 25, 27, 28, 31	10/1 R
Test Ch 3 & 4	**10/6 T**
Ch. 5, #1, 4, 6, 9, 10-12, 15, 16, 22-24, 27	10/22 R
Ch. 6 #3, 4, 5, 8, 9, 14, 37-39, 45-48	10/29 R
Ch 7 #32, 33, 34, 49, 50, 51 and handout	11/10 T
Test Ch 5 & 6 & 7	**11/17 T**
Ch. 17 #1-4, 7-12, 15, 17, 64, 65, 67	12/1 T
Ch. 13 (Read Sects. 1,2,4, 5, 12) Homework will be to teach a section. Ch. 18 (Read Sects. 1, 2, 3, 4, 5, 6, 7, 11)	12/1-3
Internet Assign. from Ch. 13 or 18	12/3
Final Exam Ch 17, 13, 18, and Phys Dept Assessment Exam	**12/10 R**