PHYS 223: Classical and Modern Physics III – Fall 2016

MWR 8:30am – 9:45am FRNK 220

Recommended Texts: *Understanding Physics* by Karen Cummings, Priscilla Laws, Edward Redish and Patrick Cooney, (2004) John Wiley & Sons, Inc. *Physics for Scientists and Engineers with Modern Physics* by Douglas C. Giancoli, (2008) Pearson Prentice Hall.
Prerequisite: Classical and Modern Physics II (PHYS 122) or by permission of the instructor.
Instructor: Dr. Pete Nelson, nelsonph@guilford.edu, Room FRNK 234A, (336) 316-2237
Office Hours: MWR 9:45-11:30, MR 1:30 – 2:30 and by appointment

Course Description

PHYS 223 is the third lecture course in a three semester calculus-based introductory physics sequence for scientists and engineers. Topics are chosen from modern and classical physics to complement those discussed in the previous year's PHYS 121 and PHYS 122 courses. This semester we will focus on electricity and magnetism though we may add additional topics as time allows. PHYS 223 counts for four elective credits in the PHYS major and counts for four credits of theoretical physics in the PHYS minor.

PHYS 223 is a lecture course loosely based on chapters 21-31 of Giancoli (chapters 22-34 of Cummings) that introduces the student to the basic principles of physics. The topics to be covered include electrostatics, magnetism, DC and AC circuits, and electromagnetic waves. Emphasis will be placed on conceptual understanding, problem solving skills and the application of physics in other scientific disciplines such as biology, chemistry, engineering and medicine.

Learning Objectives and Outcomes

Students will learn fundamental concepts in electricity and magnetism. Following this course, students will be able to successfully solve, with appropriate explanation, intermediate college-level problems in electricity and magnetism.

The three main course objectives are:

1. Gaining factual knowledge (terminology, classification, methods, trends)
2. Learning fundamental principles, generalizations, or theories
3. Learning to *apply* course material (to improve thinking, problem solving, and decisions)

To meet objective 1, students will gain the factual knowledge necessary to describe the physical world using classical physics concepts and the language of mathematics. To meet objective 2, students will learn the fundamental principles, generalizations and theories (physical laws) of how the physical world works. To meet objective 3, students will solve problems (mainly from the text) that require the application of these physical laws to everyday situations. These same laws are generally believed to apply to nearly everything:- from atoms to galaxies and beyond. Application of the scientific method has led scientists to generally believe that everything in the physical universe can be explained, understood and predicted using these simple physical laws.

Homework

Regular homework problems will be assigned approximately for each class, problem numbers and due dates will be posted on the class Canvas web page. LATE HOMEWORK PAPERS WILL NOT BE ACCEPTED. The purpose of the homework is to help you do well in the course. The only way to do well in this course is for you to work on the homework ***by yourself***. The assigned problems are usually ***very difficult***. The idea is for you to ***think*** about them ***yourself*** as you work through the problem solving method discussed in class (and outlined in the "*Zen and the art of doing physics problems*" document posted on Canvas). As discussed in *Zen and the art of doing physics problems*, homework will be graded for "attempts". For homework only, the "attempts score" will count towards your final grade. If you get stuck, consulting with others on your homework is acceptable and encouraged. However, you must write up and turn in your own paper

representing your own solution. Tests and the Final Exam will be graded for ***correctness*** only, but partial credit for *correctness* will be given for each conceptual portion of your problem solution that is correctly worked out algebraically. No partial credit will be given for doing "algebra with numbers" (AWN). See *Zen and the art of doing physics problems* for more details.

The purpose of both regular and computational homework assignments is to help you master the content of the course. You should therefore always attempt to answer each question by yourself. If you get stuck, consulting with others on your homework is acceptable and *encouraged*. However, you must write up and turn in your own paper that represents your own solution. Sharing electronic files of any kind (e.g. Python, VPython, Excel or Word documents, or images of any kind) with other students ***is not permitted***. Each student must work on their own VPython programs and/or Excel spreadsheets – from scratch. Participation credit is available for in class discussion of homework problems. Explaining where you got stuck gains maximum participation credit.

Presentation in the Physics Department Seminar

Students are required to enroll in and give a presentation in the physics department seminar. Students should explain and solve a practice Graduate Record Exam (GRE) physics problem related to the work that students have been doing in PHYS 223. Students should choose their own problem and have it approved before beginning work on their presentation. Learning how to efficiently solve physics GRE problems will serve a dual purpose: students will gain experience in solving (1) additional advanced physics problems; and (2) standardized physics problems to help prepare students for the GRE (if they choose to take it).

Workload

According to the Guilford College Faculty and Student Handbooks, "credit units are assigned to courses on the ratio of one credit unit per semester for each three hours of consistent effort per week expected from the typical student." This is a 4-credit class that requires a minimum of 12 hours of work each week from the student. 3.75 hours weekly are spent in the class sessions. Students are therefore expected to devote at least an additional 8.25 hours each week to assigned reading, writing assignments, research, the preparation of class presentations, and any required meetings with the instructor or teaching assistant. Some weeks will require that students spend more time on this course than in other weeks.

Tests and Final Exam

The tests and final exam will include questions similar to the homework problems, and they will be graded in a similar manner to how the homework was graded for correctness. There will be three tests and one final exam. The final exam is comprehensive and will cover the entire course. ATTENDANCE FOR ALL TESTS AND THE FINAL EXAM IS MANDATORY. Exceptions will be made only for acceptable, documented reasons as determined by the instructor. Requests must be made via email *prior to the absence*. Exams will be closed book, with no extra materials except for a single side of a handwritten sheet of letter-sized paper. This "cheat" sheet must be turned in at the end of the test. Telecommunications or data devices of any kind (e.g. phones, tablets, PCs, scanners, cameras, etc…) are ***banned*** from tests and exams. You should bring a calculator to tests and exams. In tests and exams, the memory of any device capable of storing *non*-numeric information (e.g. TI-83 Plus) must be zeroed at the beginning of the test.

Model solutions to the homework and test problems will be made available on Canvas after they have been graded. As the test and final exam problems will be based (primarily) upon homework problems (and problems worked in class) it is extremely important that you understand the model solutions and how to maximize your partial credit potential.

Attendance

Attendance at lectures is REQUIRED. Attendance will be taken at the beginning of class and will count towards your class participation grade. If you find that you cannot attend class (or will be late) for any reason, you should contact the instructor via email before class. Students are expected to turn up on time to at least

90% of all classes and to attend all quizzes, tests and the final exam. Students are responsible for all announcements, assignments, and material presented in class – whether they are present or not. Attendance and participation in classroom activities are extremely important and extra credit is available for in-class participation.

Academic Honor Code

The Academic Honor Code is described in the Guilford College Student Handbook, https://intranet.guilford.edu/?page_id=4014. According to the college catalog, the statement, "I have been honest and have not observed any dishonesty," gives testament to the honor system and should be pledged in writing on all academic work. Compliance is assumed even if the statement does not appear on college work. The word "pledged" may substitute for the longer statement. The work you submit is understood to be claimed by you to be your work. If others helped you, or if you got ideas from other sources, you must credit them appropriately. Violations of the Guilford Honor Code will be handled according to the Guilford College process.

The purpose of the homework assignments is for you to learn the course material. Electronic sharing of any computer files (e.g. Excel or Word) with any other person (irrespective of whether or not they are currently enrolled in this class) is ***expressly prohibited***. It is the responsibility of any student who is unsure of the grading scale or course requirements to ask the instructor for clarification.

Grading

Class Participation	50 pts
Presentation	50 pts
Homework Problems	300 pts
Tests	400 pts
Comprehensive Final Exam	200 pts†

Grade Scale: $A^+ \leq 960 < A \leq 920 < A^- \leq 880 < B^+ \leq 840 < B \leq 800 < B^- \leq 760 < C^+ \leq 720 < C \leq 680 < C^- \leq 640 < D^+ \leq 600 < D \leq 560 < D^- \leq 520 < F$.

†Final Grades will be determined on the basis of both 1000 pts (full course including extra credit) and 200 pts (just the final). The higher grade will be awarded.

Technology Requirements

This course makes extensive use of Canvas to distribute course materials electronically. Microsoft Excel (or a compatible spreadsheet program) is required for some homework assignments and a calculator is required for tests and exams.

Americans with Disabilities Act

Guilford College complies with the Americans with Disabilities Act by providing a process for disclosing disabilities and arranging for reasonable accommodations. The policy may be found online at: https://intranet.guilford.edu/?page_id=3763.

Students who require accommodations must complete a disabilities disclosure form and submit it to the Disability Resources Coordinator, located in 217 Hege Library – right down the hall from the Learning Commons (2nd floor of the library), along with the appropriate documentation. It is the student's choice to disclose difference/disability information to individual instructors. However, only students who provide their instructors with a 504 Accommodations Agreement may receive accommodations. All disability information is treated confidentially and is not a part of your academic record.

TENTATIVE Course Schedule

In order to prepare for class, please complete each reading assignment ***before*** class. Reading assignments and in-class problems will be posted on the class Canvas page. Students who read ahead and participate in class usually do much better in this class!

Week of	Topics	Reading Assignment*
Aug. 22	Introduction, electrostatics, Coulomb's law	Chapter 22
Aug. 29	Electric Fields	Chapter 23
Sept. 5	Gauss' Law	Chapter 24
Sept. 12	Electric Potential	Chapter 25
Sept. 19	Current and Resistance	Chapter 26
Sept. 26	Circuits	Chapter 27
Oct. 3	Capacitance	Chapter 28
Oct. 17	Magnetic Fields	Chapter 29
Oct 24.	Magnetic Fields Due to Currents	Chapter 30
Oct. 31	Induction and Maxwell's Equations	Chapter 31
Nov. 7	Inductors and Magnetic fields	Chapter 32
Nov. 14	Electromagnetic Oscillations and Alternating Current	Chapter 33
Nov. 28	Electromagnetic Waves	Chapter 34

*refers to Cummings.

Important Dates

Thur. Sep. 15	**Test #1**
Oct. 10-14	No class – Fall Break
Thur. Oct. 20	**Test #2**
Nov. 24	No Class – Thanksgiving
Mon. Nov. 28	**Test #3**
Thurs. Dec. 8	**Final Exam** **3:00 pm – 5:30 pm**

Technology Requirements

This course makes extensive use of Canvas to distribute course materials electronically. Microsoft Excel (or a compatible spreadsheet program) is required for some homework assignments and a calculator is required for tests and exams.

Americans with Disabilities Act

Guilford College complies with the Americans with Disabilities Act by providing a process for disclosing disabilities and arranging for reasonable accommodations. The policy may be found online at: https://intranet.guilford.edu/?page_id=3763.

Students who require accommodations must complete a disabilities disclosure form and submit it to the Disability Resources Coordinator, located in 217 Hege Library – right down the hall from the Learning Commons (2nd floor of the library), along with the appropriate documentation. It is the student's choice to disclose difference/disability information to individual instructors. However, only students who provide their instructors with a 504 Accommodations Agreement may receive accommodations. All disability information is treated confidentially and is not a part of your academic record.

Syllabus subject to change

Any changes to the syllabus will be announced in class and an updated syllabus will be posted on the course Canvas web page.