Physics 430 Electricity and Magnetism

COURSE AND INSTRUCTOR INFORMATION

Meeting Time: Monday, Wednesday, Friday 11:00
Meeting Location: Merion 124
Instructor: William H. Sawyer, Ph.D.
Office Location: Merion Hall Room 132
Office Hours: As posted
Email: wsawyer@wcupa.edu

COURSE DESCRIPTION

PHY340 This course is a course in electricity and magnetism designed for undergraduates at the junior or senior level. Topics to be covered include a review of vector analysis and vector calculus, electrostatics, electric potentials, electric fields, magnetostatics, magnetic fields, and electrodynamics through Maxwell's equations. If time permits, electromagnetic waves will also be covered.

EXPECTATIONS

An understanding of the material to be covered in this course is essential for a successful career in Physics. That said the material presented is highly formalized, mathematical, and in many cases very dense. In order to master it successfully you will have to put in a substantial amount of effort. You cannot rely on your time in class and the associated lectures alone to master the topics presented. You will have to spend a great deal of time outside class reading the material covered in the text, studying the examples provided, and preparing the homework assignments. If you have not done this up to now in your other classes please be forewarned. I will do everything in my power to help you in class, during office hours, and at other times that we can arrange. In the end, however the responsibility has to be yours.

I. Class work
   a. It will be assumed that you have read the material to be covered in class and studied the appropriate examples in the book before you arrive.
   b. If you have questions on the material to be covered in class you should be prepared to ask them and assist in providing answers to your fellow students questions.
   c. Assume that from time to time you will be called upon to answer questions about the material being discussed.

II. Homework
   a. You are ***expected to work together*** to develop your solutions to the homework assignments. Working problems is the most effective way to learn the material to be covered in this class. For this reason, the homework constitutes 50% of your grade.

   b. Although you should work together to develop the solutions to each assignment, the work you turn in should be your own. (That is, written out in your own handwriting. Of course your work will look very similar to that of your fellow students with whom you worked but if you prepare your own answers for submission there will probably be differences in how you express your results.)

   c. ***Warning:*** If you simply copy each other's' work word for word in all likelihood you will not fully understand the material and you will probably do very poorly in the exams. (If word for word copying becomes an issue, I reserve the right to (and indeed will) change the rules of the game and the grading rubric.)

d. Homework is due at the beginning of class every Friday. ***If you will not be in class, have someone else deliver your paper for you. Absence from class is not an excuse for not turning in your homework. LATE HOMEWORK WILL NOT BE GRADED***

REQUIRED COURSE MATERIALS

- Text book: **Introduction to Electrodynamics** *Fourth Edition*, David J. Griffiths, Pearson, 2012

SPECIFIC LAB OBJECTIVES

- Develop a firm understanding of intermediate electrodynamics as evidenced by the ability to solve selected exercises in electrodynamics found in the text and comparable resources
- Develop and be able to demonstrate an understanding of Maxwell's equations and apply them in selected situations
- Develop and be able to demonstrate the ability to use vector calculus as it applies to electrodynamics in Cartesian, cylindrical, and spherical coordinates

CONTACT POLICY

- Email: WSawyer@wcupa.edu (please include your name, the course number, and one or two words indicating the purpose of your email in the subject line.
- Office Phone: 610 436 2897

ASSESSMENT

I. Valuation
   1. Homework 50%
   2. Semester Exams 30%
   3. Final Exam 20%

I. Grade Range
   1. 93% - 100% A
   2. 85% - 92% B
   3. 75% - 84% C
   4. 65% - 74% D

ATTENDANCE POLICY

More than 15 minutes late, you will not be seated

The Pennsylvania Department of Health has noted a significant increase in the incidence of influenza (flu) and the norovirus (responsible for severe vomiting and diarrhea) in our region this winter. Influenza is now becoming widespread through much of the country. Both of these viruses can be easily spread from person to person.

West Chester University Student Health Services will follow CDC recommendations directed towards reducing the burden of the disease and minimizing its spread. The CDC recommends that individuals with flu stay at home for at least 24 hours after fever is gone without the use of a fever-reducing medicine. The CDC also recommends that individuals with unexplained vomiting or diarrhea should be advised to stay home until they are completely well.

The University is strongly urging students with flu or norovirus to go home to rest and recover. Students who are unable to go home should not to attend classes or any public gatherings.

I understand absenteeism can have an impact on your semester. If you miss class due to flu or the norovirus I will make every reasonable effort to enable you to complete your course work.

- If you miss an exam because you were sick you will be required to present a note from the University Health Service or a physician in order to take a make-up exam.
- If you are sick on the day that a homework assignment is due make arrangements for someone to deliver what you have been able to complete or email me a scanned copy of your work. I will not be able to give you credit for late homework.

You may find the following links helpful http://www.cdc.gov/flu/ and http://www.cdc.gov/norovirus/

DISABILITY STATEMENT

If you have a disability that will require special accommodation, please meet with me as soon as possible to discuss your needs. Also, contact the Office of Students with Disabilities at (610) 436-2564. Both the WCU and I desire to comply with the ADA of 1990.

ELECTRONIC DEVICES POLICY

In order to create a conductive learning environment, please arrange for all electronic devices to be set in silent/vibrate mode and put away. If you need to use a device to accommodate a disability, please see above.

D2L

- This course has a D2L web page. Homework solutions will be posted there the week following when they are due.
- From time to time other important information may also be posted there.

ACADEMIC INTEGRITY & CONDUCT

I have a zero tolerance policy for breaches of academic integrity. Breaches of academic integrity will be investigated and sanctions imposed to the full extent available under University policy. For questions regarding the university 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.

UNIVERSITY SANCTIONED EVENTS

If you will be participating in a University-sanctioned event during a class, **please notify me in advance**.

PUBLIC SAFETY

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

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

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TENTATIVE SCHEDULE*

Date		Lecture	Homework (Due each Friday)
M	Jan. 28	Introduction to Electrodynamics, Vector Algebra	1.10, 1.13, 1.16,
W	Jan. 30	Vector Algebra	1.26, 1.27
F	Feb. 1	Differential Calculus	
M	Feb. 4	Integral Calculus	1.30, 1.32, 1.34,
W	Feb. 6	Curvilinear Coordinates	1.38, 1.39, 1.44,
F	Feb. 8	1 & 3-Dimensional Dirac Delta Function & Vector Fields	
M	Feb.11	**No Class**	1.46, 1.61, 1.62, 1.63
W	Feb. 13	Electric Field and Gauss's Law	2.1, 2.5, 2.18,
F	Feb. 15	Divergence and Curl of **E**	
M	Feb. 18	Electric Potential	2.21, 2.28, 2.32, 2.33,
W	Feb. 20	Work and Energy in Electrostatics	2.42, 2.43, 2.47
F	Feb. 22	Conductors	
M	Feb. 25	Laplace's Equation	3.1, 3.4, 3.6, 3.7,
W	Feb. 27	Method of Images	3.11, 3.13, 3.19, 3.24
F	Mar. 1	Separation of Variables	
M	Mar. 4	**First Exam**	
W	Mar. 6	Multipole expansion	3.28, 3.33, 3.47,
F	Mar. 8	Polarization and Bound Charges	4.2, 4.6
M	Mar. 11	The Field Inside a dielectric and Gauss's Law	4.16, 4.17, 4.19, 4.21
W	Mar. 13	Linear Dielectrics	4.24, 4.26, 4.31
F	Mar. 15	Energy in Dielectric Systems and Forces on Dielectrics	
M	Mar. 18		
W	Mar. 20	**SPRING BREAK**	
F	Mar. 22		
M	Mar. 25	Lorentz Force Law	5.1, 5.6, 5.8, 5.11,
W	Mar. 27	The Law of Biot-Savart, St. Line currents, Divergence & Curl of **B**	5.14, 5.16, 5.20,
F	Mar. 29	Ampere's Law and Comparison of Magnetostatics and Electrostatics	
M	Apr. 1	Magnetic Vector Potential	5.23, 5.27, 5.33, 5.34
W	Apr. 3	Magnetization and Bound Currents	5.59, 6.2, 6.7, 6.10
F	Apr. 5	The Field of a Magnetized Object	
M	Apr. 8	**Second Exam**	
W	Apr. 10	Interpretation, Ampere's Law in Materials, & Boundary Conditions	6.11, 6.12, 6.14,
F	Apr. 12	Linear and Nonlinear Media	6.16, 6.21
M	Apr. 15	Electromotive Force	7.1, 7.3, 7.5, 7.7,
W	Apr. 17	Faraday's Law and the Induced Electric Field	7.12, 7.15, 7.22,7.28, 7.31
F	Apr. 19	Inductance & Energy in Magnetic Fields	
M	Apr. 22	Maxwell's Equations	7.34, 7.36, 7.40, 7.62,
W	Apr. 24	Boundary Conditions	8.1, 8.4, 8.5
F	Apr. 26	Charge & Energy, Newton's 3rd Law, Maxwell's Stress Tensor	
M	Apr. 29	Conservation of Momentum, Work done by Magnetic Forces	8.9, 8.13, 8.21, 9.2,
W	May 1	Waves in One Dimension	9.3, 9.8a, 9.10, 9.13
F	May 3	Electromagnetic Waves in a Vacuum	
M	May 6	Electromagnetic Waves in Matter	9.14, 9.16, 9.19, 9.23,
W	May 8	Absorption and Dispersion	9.28, 9.38
F	May 10	Guided Waves	
TBA		**Final Exam**	

*Instructor reserves the right to adjust this schedule as necessary during the semester to ensure a satisfactory learning experience.

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GRADING RUBRIC FOR HOMEWORK AND EXAMS (*Work that cannot be **easily** read will not be graded resulting in a 0 for that problem*)

Single Part Problems[1]

Grading Criteria	Point Value
• The Problem is properly set up • The solution is clearly stated using words where appropriate to explain how you got from one step to the next. • Your logic is clear. • The result is correct	5 points
• Problem is properly set up but there is a numerical error or an algebraic mistake • None the less the transitions from one step to the next are clearly stated and • Your logic is clear	4 points
• You have the correct concept and explained it clearly but the problem is incorrectly executed.	2 points
• You have clearly made an honest attempt to do the problem but you are lost.	1 point
• You have not done the problem or what you have submitted is meaningless or indecipherable	0 points

Multiple Part Problems[1, 2] (the grading below applies to each part of the problem individually)

Grading Criteria	Point Value
• Problem is properly set up • The solution is clearly stated using words where appropriate to explain how you got from one step to the next. • Your logic is clear. • The result is correct	3 points
• Problem is properly set up but there is a numerical error or an algebraic mistake • Transitions from one step to the next are clearly stated	2 points
• You have the correct concept and explained it clearly but the problem is incorrectly executed.	1 point
• You have made an honest attempt to solve a particular section of the problem but have not been able to do so, • You have not done the problem or • what you have submitted is meaningless or indecipherable	0 points

[1]These criteria apply to both problems seeking a numerical answer and those that require a proof or an illustration.

[2]Clearly multiple part problems are worth more than single part problems as you would expect.