PHY 3324: Electromagnetism II

CRN 85562

Fall 2015

3 Credit Hr

Lecture:	TR 9:00am – 10:20am
Room:	BS 303
Instructor:	Dr. Korey D Sorge
Required Text:	*Introduction to Electrodynamics*, 4rd Edition
	by D. J. Griffiths
Alt Text:	*Introduction to Electrodynamics*, 3th Edition
	by D. J. Griffiths
Prereqs:	PHY 3323 — Electromagnetism 1
Inst. Perm. Req.?:	No
Web:	course homepage on "BlackBoard"
Office Hours:	TR 11:00am – 1:00pm (however, my door is always open)
Office:	S&E 116
Lab:	S&E 147
Email:	May be useful for other students $\rightarrow$ Use "Discussion Board."
	Not useful for other students $\rightarrow$ Use "Course Email."
	Needs discretion (ADA, etc.) $\rightarrow$ ksorge@fau.edu
Phone:	Skype for Business "ksorge@fau.edu"

Place in Curriculum

This course is a required component for the BS degree in the Department of Physics.

Course Description

This course is the second part of a two-semester sequence on electromagnetism. It begins with an introduction to conservation laws. The course then proceeds to discuss electromagnetic waves and their interaction with interfaces, leading to geometrical optics. Interference and diffraction will be addressed as well as some optical applications. Potential formulation is then used to study time-varying fields and radiation. Finally, a look at special relativity and field transformations will be studied.

Course Objectives / Student Learning Outcomes

- Construct solutions to Laplace's Equation to solve boundary value problems.

  - Formulate solutions in planar and spherical geometries.
  - Illustrate solutions using computational techniques.

- Generalize Conservation of Energy and Conservation of Momentum.

  - Demonstrate the principle of Conservation of Energy in an electromagnetic system.
  - Examine the principle of Conservation of Momentum in an electromagnetic system.

- Break down electromagnetic wave phenomena.

  - Characterize properties of waves that are incident on conducting and non-conducting media.
  - Examine the properties of electromagnetic waves in a waveguide.

- Establish the use of potential formulation to characterize electromagnetic radiation.

- Develop more sophisticated tools to study relativity in general and relativistic electromagnetism in particular.

Lecture

Lecture will be a rather diverse presentation of major concepts in the course. It will consist of. . .

- presentation of concepts through lecture,

- group projects for real-time application of ideas (and for points),

- concept questions to get you from *quantitative* to *qualitative* understanding, as well as

- demos, movies, and web materials.

Computer- and web-based materials presented in class will be made available after class on BlackBoard. This will be helpful for reviewing materials that can't be noted in class.

Course Evaluation Method

Attendance	= 5%
Exam 1	= 15%
Exam 2	= 25%
Exam 3	= 25%
Final	= 30%
	= 100%

Exams

There will be three exams through the course of the semester, as well as a final exam.

Exam 1	Tuesday September 1st
Exam 2	Tuesday September 29th
Exam 3	Tuesday October 27th
Final Exam	Tuesday December 8th (7:45–10:15am — Comprehensive)

Pen/Pencil and calculator are the only materials allowed for these exams. I will give mathematical information given on the inside covers of the book as well as some other useful formulas.

Please note that you must have a genuine and valid reason for missing or rescheduling a test. This could be something like surgery (with a doctor's note) or proof of jury duty. An excuse such as "I had a headache," or "my boss wanted me to work an extra shift" is unacceptable. The exam schedule is given. Valid reasons for missing the test must be given ***in advance***. Not following this rule means that I don't have to reschedule a test for you.

Homework

Homework will consist of problems designed by me, selected exercises from the book, concept questions and computer exercises. Being able to do these problems is *VITAL* to understanding the material and getting ready for exams. If you are accustomed to looking for solutions online, I will *STRONGLY DISCOURAGE* this behavior. You will not be allowed that resource for exams and if you become used to this crutch, you *will* fail the exams.

There will typically be 1 or 2 problems given at the end of every lecture. This will likely not be enough to internalize the material and doing extra problems will be essential for mastery. I *STRONGLY ENCOURAGE* that you work up solutions worthy of handing in to create a library of problems. A good model to follow (either implicitly or explicitly) is...

Problem Concept: What type of problem is this? What is the primary concept being studied with the problem?

Important Concepts, Relations and Equations: What are important concepts, relations and equations? For example, if we are doing a problem with Gauss' Law, this is where you would tell me what Gauss' Law is.

Approach to Problem: How do you plan to approach the problem (in words)? Give me your step-by-step approach.

Details of the Calculation: Now, solve the problem. Walk me through important steps. Make clear what your final answer is.

Grading

Grading will be on a normalized point system. The point values for the class are given below.

Attendance:	20 pts.
First Exam:	60 pts.
Second Exam:	100 pts.
Third Exam:	100 pts.
Final Comprehensive Exam:	120 pts.

This gives a total of 400 pts. Letter grades will be assigned by the following scale

A:	92.5% and higher
A-:	87.5% − 92.5%
B+:	82.5% − 87.5%
B:	77.5% − 82.5%
B-:	72.5% − 77.5%
C+:	67.5% − 72.5%
C:	60.00% − 67.5%
C-:	not given
D+:	55.0% − 60.00%
D:	50.0% − 55.0%
D-:	45.0% − 50.0%
F:	lower than 45.0%

Boilerplate

Policy on makeup tests, late work, and incompletes Please note that you must have a genuine and valid reason for missing or taking a test at a later time. This could be something like surgery (with a doctor's note) or proof of jury duty. An excuse such as "I had a headache," or "my boss wanted me to work an extra shift" is unacceptable. The exam schedule is given. Valid reasons for missing the test must be given in advance. Not following this rule means that I don't have to reschedule a test for you.

As stated above, homework is due at 7pm on the due dates. You are welcome to submit assignments early. I do not give credit for late homework but will grade everything handed to me.

Note that grades of Incomplete ("I") are reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate.

Classroom etiquette policy University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

Students with Disabilities In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) located in Boca Raton—SU 133 (561-297-3880), and follow all OSD procedures.

Honor Code Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see `http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf`.

Course topical outline Students are expected to read and study for 2 hrs outside of the classroom for every 1 hr they spend in class. This means you have a *minimum* of 2 hrs and 40 min of outside study time every week for this course.

Last updated: January 20, 2016

PHY 3324: Electromagnetism 2
Fall 2015
Dr. Korey D. Sorge

Date		Lecture	Topic
Aug	18	1	Syllabus / Electrostatics Review
	20	2	Magnetostatics Review
	25	3	EM Dynamics Review
	27	4	Problem Session
Sep	1		**Exam 1**
	3	5	Laplace's Equation & Method of Images
	8	6	Separation of Variables 1
	10	7	Separation of Variables 2
	15	8	Conservation of Energy
	17	9	Einstein Summation Notation
	22	10	Conservation of Momentum 1
	24	11	Conservation of Momentum 2
	29		**Exam 2**
Oct	1	12	Waves and the Wave Equation
	6	13	EM Waves in Normal Incidence to Linear Media
	8	14	EM Waves in Non-normal Incidence to Linear Media
	13	15	EM Waves and Conductors
	15	16	Waveguides
	20	17	More EM Waves in Materials
	22	18	Homework Review
	27		**Exam 3**
	29	19	Potential Formulation and Gauge Transformations
Nov	3	20	Retarded Potentials
	5	21	Time-dependent Fields
	10	22	Radiation
	12	23	Relativity Review
	17	24	The Boost Matrix and Intervals
	19	25	Force Transformations
	24	26	The Current 4-vector
	26		**Thanksgiving Day** (No Class)
	30		Reading Day
Dec	1–2		Reading Days
	8		**Final Exam**