

Syllabus

PHY 3320 – Electromagnetism 1 – Spring 2021

Instructor : Dominique Laroche, Department of Physics

Office: NPB 2261, tel 352-392-8591

Class details: Synchronous zoom lectures/in person lectures, M, W, F Period 5 (11:45 AM -12:35 PM). Zoom

link: <https://ufl.zoom.us/j/99021759055?pwd=dWxWcW1XamV0MnB6cXJUNGxBRXFEQT09>

Email : dlaroc10@ufl.edu I will attempt to respond to emails within 24 hours

Office hours (tentative): M, 12:50 to 1:40 PM (6th period) and Tu 10:40 to 11:30 AM (4th period) on zoom. Should you need to talk to me outside office hours, feel free to email me so that we can schedule an appointment.

Class website: Class syllabus and calendar, assignments, extra material, zoom links and recording as well as exams and relevant announcements will all take place on the class Canvas website (www.ufl.instructure.com/courses for login).

Prerequisites: Physics 2 (PHY 2049, PHY 2061 or equivalent) and Introductory Differential Equations (MAP 2302 or equivalent).

Textbook : Introduction to Electrodynamics, 4th Edition, (Cambridge University Press) by D. J. Griffiths. This textbook will also be used in PHY 4324.

Supplementary textbook : Students looking for more advanced material can look at Modern Electrodynamics by Andrew Zangwill. This textbook is however not required for the course.

Course description :

Starting from the jolts of electricity that carry and process information in your brain, electrical and magnetic phenomenon surround our every day life. Beyond the electricity that is being used by most of your appliances and smart devices, friction and the normal force, radio and WIFI communications, visible light and related corrective apparatus as well as the fact that we are not burnt to a crisp by the sun's ray can all be explained within electromagnetic theory. PHY 3323 is the first course of a series of 2 for undergraduate level electrodynamics. It covers electro- and magneto-statics both in the vacuum and inside matter, which corresponds to the first 6 chapters of the textbook. Chapters 7 and beyond are covered in the second course in the series, EM2 (PHY 4324). A significant portion of the material covered in this course should have already been covered through prior studies. These concepts will be

revisited using more powerful mathematical tools and expanded to more challenging applications. By the end of the course, students will be expected to have the knowledge and the mathematical machinery to solve standard problems in the static aspect of electromagnetism, and have a conceptual understanding of the subject. Problems dealing with evolving charge and currents configurations will be the subject of the second course in the series, and more specialized problems are the subjects of discipline-specific advanced courses.

Course Learning Goals: At the end of the course, you will be expected to show familiarity and understanding of various aspects of electromagnetism theory such as : 1) Electro and magnetostatics fields and forces

2) Electrical potential and magnetic vector potential

3) Separation of variable methods for solving boundary value electro- and magnetostatic problems

4) Multipole expansions

5) Electric and magnetic field in matter

You should be able to showcase your grasp on these subjects by :

i) Providing qualitative explanations of complex systems/phenomenon

ii) Performing order of magnitude estimates

iii) Symbolically solving problems

Course expectations: Students enrolling in this class should be comfortable with calculus I and II: vector calculus, differentiation, integration and trigonometry. Students are also expected to be able to solve ordinary differential equations and be familiar with multi-variable calculus in Cartesian, spherical and cylindrical geometries, as well as line and surface integrals. There is no secret to success in this class. If you attend class, read the textbook ahead of times, review the class notes, and work the problems and examples diligently, then you will learn the material. I cannot stress how important learning to solve the problems on your own is. Simply reading out the solutions is generally insufficient to learn the material! On average, you are expected to devote 6 to 10 hours a week (outside of classes) to keep up with the material. If at any time there is a question in your mind, either during classes or outside of classroom hours, please do not hesitate to talk to the instructor. All exams and quizzes will be “closed-book” and no notes and/or calculator will be allowed. Essential mathematical formulas/expressions will be provided, and they will be shared with the class ahead of time. However, you will be expected to know the most important physics equations and formulas.

Online teaching considerations:

Communication: The preferred mode of communication is through email. Within the instructor's best ability, inquiries will be answered within 24 hours. Messages sent through Canvas will also be answered within the same timeframe.

Class recording policy : Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Expected demeanor: Studying remotely can be challenging both on the students and the instructors. To make everyone's life easier, please mute yourself or use the "push-to-talk" functions if you are in a loud/busy environment. To minimize disruptions from people that show up late, new participants will automatically be muted upon entry. If you wish to verbally ask a question/interject, please remember to unmute yourself. If you have a question during lecturing, feel free to type it in the chat or politely interject.

In-person expectations and requirements : All students attending the live section of the course have to have been cleared to return to campus. This status is accessible on your one.ufl.edu account. If you are not cleared to return to campus, you CANNOT attend the live section and will be asked to leave. All classes will be streamed synchronously on zoom, and will be recorded. Students in the live section can follow the course remotely if they so desire, and will not be penalized for doing so. All students in the live class MUST wear a cloth mask over BOTH the mouth and the nose. Failure to respect this rule will result in a single (daily) warning, followed by a request to leave the class. Should students refuse to comply, the live section of the lecture will be adjourned; and the zoom version will resume once I have reached my office. All students joining the class without being cleared or refusing to comply with mask policies will be reported to the relevant University authorities. Here is a list of the other guidelines to follow in the live section of the course :

- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated

seats and maintain appropriate spacing between students. Please do not move desks or stations.

- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms ([Click here for guidance from the CDC on symptoms of coronavirus](#)), please use the UF Health screening system and follow the instructions on whether you are able to attend class. [Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms](#).
- There will be no in-person session on the day of quizzes, that is on 02/08, 02/22, 03/22 and 04/12.

Examinations: All quizzes and exams will take place through Honorlock, UF official online proctoring partner. This means that class will occur remotely on 02/08, 02/22, 03/22 and 04/12. I encourage you to read the following handout to familiarize yourself with the process: <https://dce.ufl.edu/media/dceufledu/pdfs/Honorlock-Student-Exam-Preparation-Information.pdf>

A practice quiz will be available prior to the first proctored graded assignment.

If any student has concerns/difficulties, please contact the Instructor in a timely fashion.

Technical issue during proctored exam :

If for any reason reasons you have technical issues or you need clarification during the proctored exam, you will be authorized to send me an email. The standard response to a Honorlock failure will be to contact the instructor by email as soon as possible.

Attendance and preparation: Attendance in class is definitely expected. Part of the grade will be based on class participation, and material outside the textbook will be presented. You are responsible for all material covered in the text AND in class. Recordings of the zoom lectures will be available on the Canvas website.

Students will be expected to have read the relevant material before coming to class. The material covered in the textbook will be quickly covered in class, and a large section of the lectures will consist of illustrating concepts with examples, discussing additional material omitted in the text, pointing out subtle points and common mistakes, and asking questions to clarify misconceptions.

Grading:

The graded material will consist of the following, and will be counted out of a total of 100 points.

Homework (10)	→ 7.5% of total grade
Group Homework (10)	→ 10% of total grade
Quizzes (4)	→ 15% of total grade
Mid-term exam	→ 25% / 0% of total grade

Final exam → 35% / 60% of total grade
In-class group assignments → 7.5% of total grade

Homework will be assigned almost every week. I strongly encourage everybody to come up with the solutions on their own, and not to look up the answers online. Doing so will be great beneficial to your understanding of the material and to your performance during the other examinations. Each individual homework will be worth 0.75% of the final grade. An 11th homework will be assigned, and will count towards bonus point for the group homework. Only a subset of the questions will be graded each week, but solutions to all problems will be posted.

Quizzes will be held in class, will last 60 minutes and will consist of 1-3 slightly modified homework problems / In-class group assignment / textbook example. One question might also include additional recommended problems. Each quiz will cover the material that has been covered since the last quiz/exam. Only the best 3 quizzes (out of 4) will count towards the final grade, for 5% each.

Both the **mid-term** and the **final exam** will be comprehensive. If the grade on the final exam is better than one on the mid-term exam, the final exam will be worth 60% of the final grade and the mid-term will not count towards the final grade. Otherwise, the mid-term will be worth 25% and the final exam 35%. The exams will be taken and submitted through Honorlock. The mid-term will be 2h long and will be held from 8:20 - 10:10 pm at a date to be determined. The final examination will be held on **4/30/2021 @ 7:30 AM - 9:30 AM**

In class participation: Once or twice a week starting during the 2nd week of class, the students will be randomly divided in groups of 4-5 students. All groups will have 5-10 minutes to answer one or two conceptual questions.

The questions are likely to be challenging and the most important thing will not necessarily be to provide the correct answer, but to explain your reasoning. Every answer will be ranked along this scale :

0 – No answer, or answer severely lacking

1 – Reasonable effort, but numerous flaws or correct answer with minimal reasoning.

2 – Correct answer, or answer with small flaws, but with valuable insight.

3 – Especially insightful answer or correct answer to a truly challenging problem.

At the end of the class, an average of 1.6 on the cumulative class participation score will provide full marks in this section of the coursework, which count for 7.5% of the total grade.

Your answer sent to the instructor should include :

i) Answer

ii) Likely pitfall you believe you avoided

iii) Most challenging part of the question and strategy to overcome it.

Group homework: As a part of the daily homework, group of 4 students will be assigned a single homework to work in details. The groups will be randomly selected, but you can request (at your discretion) to be paired with someone. Each group will stick together for half the semester.

In the solution, I will expect to find :

a) The solution

b) Useful information to achieve the solution such as :

- i) Pitfall encountered / likely mistakes
- ii) Alternative ways to solve the problem
- iii) Difficulties and approach/tricks to overcome them

These solutions will be posted in the Canvas discussion board. The objective is to provide a student's perspective on how to solve the problems. An incorrect but detailed and insightful solution will receive a better grade than a correct but brief solution.

Submissions are due the day after the homework. One group member must submit the solution and mention all group members. The rest of the group must then confirm the submission. Only after you have posted a message can other people's comments become visible. You are encouraged to comment on other's group solutions.

The grading scheme is outlined below. The passing grade for Physics major is C and above. More information is available in the University official grading policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

A	→	85% -- 100%	→	4.0 Grade point
A-	→	80% -- 84.999%	→	3.67 Grade point
B+	→	75% -- 79.999%	→	3.33 Grade point
B	→	70% -- 74.999%	→	3.0 Grade point
B-	→	65% -- 69.999%	→	2.67 Grade point
C+	→	60% -- 64.999%	→	2.33 Grade point
C	→	55% -- 59.999%	→	2.0 Grade point
C-	→	50% -- 54.999%	→	1.67 Grade point
D+	→	45% -- 49.999%	→	1.33 Grade point
D	→	40% -- 44.999%	→	1.0 Grade point
E	→	0% -- 39.999%	→	0.0 Grade point

Make-Up of Graded Material: Consistent with university policies

(<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/#absencestext>), students will be allowed to make-up in-class graded material (exams and quizzes). In most circumstances, the

reason for the make-up will need to be documented by a note typically from a medical doctor, an attorney, or a UF official. Other valid reasons include religious holidays and death from family members). Notes from family members are not acceptable. When possible, the student should inform the instructor in advance of absences from graded assignments. Barring exceptional circumstances, make-up for the homework and in-class participation will not be allowed, as the solutions will be posted after the deadline. To make up for missed homework/class participation events, additional participation points might be made available upon request to the instructor.

Calendar (tentative):

Please note that an updated calendar will be kept up to date on the Canvas website.

Meeting #	Date	Topics	Key events
1	M, 01/11	Introduction, math review	
2	W, 01/13	Vector and vector calculus. Ch 1.1	
3	F, 01/15	Differential and integral calculus. Ch 1.2, 1.3	
4	M, 01/18	<i>Martin Luther King day</i>	No class
5	W, 01/20	Integral calculus and curvilinear systems. Ch 1.3, 1.4	
6	F, 01/22	Curvilinear systems. Ch 1.4	
7	M, 01/25	Delta function. Ch 1.5	
8	W, 01/27	Electric field. Ch 2.1	HW # 1 due
9	F, 01/29	Electric field. Ch 2.1	
10	M, 02/01	Gauss's law. Ch 2.2	
11	W, 02/03	Gauss's law application and E. potential. Ch 2.2, 2.3	HW # 2 due
12	F, 02/05	Potential and boundary conds. Ch 2.3	
13	M, 02/08	Quiz #1	Quiz #1
14	W, 02/10	Work and energy for E. Ch 2.4	HW # 3 due
15	F, 02/12	Conductors. Ch 2.5	
16	M, 02/15	Capacitors and Laplace equation. Ch 2.5, 3.1	
17	W, 02/17	Method of images. Ch 3.2	HW # 4 due
18	F, 02/19	Separation of variables : Cartesian. Ch 3.3	
19	M, 02/22	Quiz #2	Quiz #2
20	W, 02/24	Separation of variables : Cartesian. Ch 3.3	HW # 5 due
21	F, 02/26	Separation of variables : Spherical. Ch 3.3	
22	M, 03/01	Separation of variables : Spherical. Ch 3.3	
23	W, 03/03	Problem solving	No new material
24	Th, 03/04	Mid-term exam : 8:20 PM – 10:10 PM	Mid-term
25	F, 03/05	Separation of variables : Cylindrical. Ch 3.3	
26	M, 03/08	Multipole expansion. Ch 3.4	
27	W, 03/10	Dipoles. Ch 3.4	HW # 6 due
28	F, 03/12	Polarization Ch. 4.1	
29	M, 03/15	E. field inside matter. Ch 4.2, 4.3	
30	W, 03/17	Linear dielectrics, Ch 4.4	HW # 7 due

31	F, 03/19	Energy and force in dielectrics, Ch 4.4	
32	M, 03/22	Quiz #3	Quiz #3
33	W, 03/24	<i>Recharge day</i>	No class
34	F, 03/26	Lorentz force, Ch 5.1	
35	M, 03/29	Currents and Biot-Savart Law, Ch 5.2	
36	W, 03/31	Biot-Savart Law, Ch 5.2	HW # 8 due
37	F, 04/02	Ampere's law, Ch 5.3	
38	M, 04/05	Magnetic vector potential, Ch 5.4	
39	W, 04/07	Magnetic dipole moment, Ch 5.4	HW # 9 due
40	F, 04/09	Magnetism, Ch 6.1& 6.4	
41	M, 04/12	Quiz #4	Quiz # 4
42	W, 04/14	Magnetization and field of M. objects, Ch 6.1, 6.2	HW # 10 due
43	F, 04/16	Magnetic field of objects, Ch 6.2	
44	M, 04/19	H-field, Ch 6.3, 6.4	
45	W, 04/21	Review	HW # 11 due
46	F, 04/30	Final exam : 7:30 AM – 9:30 AM	Final exam

Incomplete Policy:

A grade of incomplete is typically given to students who endure a situation in which they are incapable of completing the coursework. The I-grade is not to be given to students who are simply dissatisfied with their performance in the course. If you find you are in a situation that might qualify you for an I-grade in this course and you want to pursue this potential option, then you must contact me immediately and be sure to have the necessary documentation from a medical doctor or an attorney. Again, letters from family members are not acceptable. A letter of understanding indicating when and how the incomplete grade will be made up will eventually be drafted and signed by the student and the Instructor. A PDF of the policy is posted at: <http://www.phys.ufl.edu/downloads/gradepolicy.pdf>.

Grading adjustments:

The graded material will be returned by email in a timely manner, typically within one-week of submission. If students notice an error or are dissatisfied with the grading, they should contact the instructor within 2 days of receiving it, and set-up a time to review the grading. Failure to do so will result in the student relinquishing the opportunity to review the grading.

STUDENTS with DISABILITIES:

Students who require accommodation for disabilities/learning barriers must first contact the Dean of Students Office. That office will provide documentation, which the student must bring to his/her instructors AS SOON AS POSSIBLE. Contact the Disability Resources Center (352-392-8565 or <https://disability.ufl.edu/students/get-started/>) for information about available resources for students with disabilities.

Academic Honesty: Each student is expected to hold himself/herself to a high standard of academic honesty. Under the UF academic honesty policy (<https://sccr.dso.ufl.edu/process/student-conduct-code/>), unauthorized assistance or the use of unauthorized resources is strictly forbidden on work-for-credit. Although discussions among the students are highly encouraged, you are to work alone on all homework assignments unless specified otherwise. Fabrication or falsification of excuses or related documentation is also a violation of the UF academic honesty policy. **Violations of this policy will be dealt with severely. There will be no warnings or exceptions.**

Online course evaluation : Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at gatorevals.aa.ufl.edu/public-results/.

COUNSELING, MENTAL HEALTH and ADDITIONAL RESOURCES:

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit [U Matter, We Care website \(https://umatter.ufl.edu/\)](https://umatter.ufl.edu/) to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: [Visit the Counseling and Wellness Center website \(https://counseling.ufl.edu/\)](https://counseling.ufl.edu/) or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website (<https://shcc.ufl.edu/>).

University Police Department: Visit UF Police Department website (<https://police.ufl.edu/>) or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website (<https://ufhealth.org/emergency-room-trauma-center>).

E-learning technical support: Contact the UF Computing Help Desk (<https://helpdesk.ufl.edu/>) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601 (<https://career.ufl.edu/>). Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources (<https://cms.uflib.ufl.edu/ask>).

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring (<https://teachingcenter.ufl.edu/>).

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information (<https://sccr.dso.ufl.edu/policies/student-honor-%20code-student-conduct-code/>).

On-Line Students Complaints: View the Distance Learning Student Complaint Process (<https://distance.ufl.edu/getting-help/student-complaint-process/>).