COURSE INFORMATION – Spring 2024

Physics 3034: Radiation and Optics

Class: Workman 310, MWF 9:00–9:50 am

Office Hours

Tues. 15:00–17:00 or Thurs. 16:00–18:00, or by appointment

Class Instructor: Dr. Richard Sonnenfeld
Office: Workman 341
Cell Phone: 575-838-7113 (until 10 pm)
Email: Richard.Sonnenfeld@nmt.edu

1 Course Content and Requirements

1.1 Place of Phys 3034 in the NMT Curriculum

Welcome to the second semester of Electromagnetic Theory. It is a required course for all Physics majors and is also an option for physics minors and electrical engineers. This is your terminal undergraduate course in electromagnetism, and will prepare you for the challenges of electrodynamics throughout science and technology.

1.2 Course Description & Prerequisites

This course explores the behavior of electromagnetic waves using Maxwell's equations and the Lorentz force law. Included in the course are the topics of radiation, conservation laws, electrodynamics, and the origin of basic optical properties of materials.

Prereq's: PHYS 3033; transfer students may take PHYS 2042 as a co-requisite Coreq: MATH 3036

1.3 Learning Outcomes

Course

Able to derive the wave equation and properties of electromagnetic waves from Maxwell's equations. Able to calculate fields, potentials and currents for electromagnetic radiation. Apply to important situations, such as reflection and transmission at dielectric or conducting interfaces. Understand the origin of electromagnetic radiation.

Program

`https://www.nmt.edu/academics/physics/Outcomes.php`

1.4 Website

Canvas: `https://nmt.instructure.com/login/canvas`
Download problem sets and upload reading assignments here.

1.5 Questions and Corrections in Lecture

I encourage questions in lecture, and know it takes courage to ask a question in front of your peers. Questions make the lecture much more interesting and relevant for all. Extra credit points will often be given for questions, and always for corrections or clarifications.

1.6 Text and Supplementary Material

Required Textbook: *Introduction to Electrodynamics*, David Griffiths, 4th edition. (You may use an earlier edition for the readings, but problem numbers are based on 4th edition.)

1.7 Programming

Some problems will require numerical calculations. You may use any software that you are familiar with. I am personally familiar with Matlab and Python with matplotlib. I do not know Mathematica or Maple, so I will not be able to help you if you choose those. I will provide example python code in most cases.

2 Grading

Your grade includes homework (45%), exams (45%), and Reading Assignments (10%).

2.1 Reading Assignments

You will be asked to read roughly one section a lecture. It is really important to actively read (which means checking derivations and making notes). However, all I will ask is for you to ask one or two questions about the reading assignment. Readings will be graded on a 10 point scale. Try to ask a specific question about what was unclear, or seemed contradictory or inconsistent with what you already knew. If you aren't confused at all, ask the kind of question that you think others might find confusing. I will use your questions to guide class discussion.

Reading assignments must be typed and submitted as .pdfs. Late reading assignments will incur a one point penalty per week.

2.2 Homework

Homework and its due dates are posted on Canvas. Homework shall be done on paper. If you are unable to attend the class where it is due, you may submit a scanned copy. The scan must be of high quality, ideally from a scanner, but a scanning app is acceptable. If the scan cannot be easily read, the homework will not be graded.

Homework **shall** be done one piece of paper (or more, if requred) per problem. This makes it easier to grade.

Problems should *almost always* show a 3x3 inch figure, the fundamental equations used, and an orderly series of steps leading from fundamentals to answer. Numerical answers without physical units are incomplete, and points will be deducted.

Each problem **shall** have the *SPN* on the top right corner, circled. Where appropriate, the final answer (either formula or number) **shall** be included in a box (or a different color) **next to** the problem number.

2.3 Exams

Exams are in-class "short" answer and take-home (posted in afternoon, due following morning). You may bring a scientific calculator but no notes to the in-class portion. Involved formulae like the Laplacian in spherical coordinates will be provided. Basic constants (e.g. charge of an electron) or physics laws (e.g. Maxwell's equations) will not be provided. These should be memorized. You may use your textbook (but no web resources) for the take-home portion. You may not collaborate on take-home exams.

3 Academic Honesty:

New Mexico Tech's Academic Honesty Policy for undergraduate and graduate students is found in the catalog, which can be found at: `https://www.nmt.edu/registrar/catalogs.php/`. Further information about academic honesty can be found on the Associate Vice President for Academic Affairs website: `https://www.nmt.edu/academicaffairs/avpaa/academic_honesty.php` You are responsible for knowing, understanding, and following this policy.

3.1 Specifics for Phys334

Homework You are supposed to do your own homework, although you are more than welcome to collaborate or cross-check with partners. All the answers for the problems in Griffiths are readily available online. If I detect evidence that you copied these or otherwise did not do your own work, I can give you a zero on the problem or the entire assignment, and refer it to the Dean.

In-class Exams Use only the material that is specified, generally a formula card or sheet.

Take Home Exams COLLABORATION ON TAKE-HOME EXAMS IS NOT PERMITTED! The allowed reference material for take-home exams is the text book and your own notes. Cheating on a exam will result in a zero grade for that exam.

4 Getting Help

I encourage you to form a homework team and will help connect you to other students if you need this help. Collaborating on homework to crack the solution is fine but the work you submit should be your own. I have added a "Discussion section" to Canvas if this is helpful for the homework.

I am glad to answer your questions on the discussion board of Canvas, in office hours, or via e-mail.

4.1 Sex 'n Drugs 'n Rock-n-Roll (and Family and Money)

I think I have covered the five areas of a college students life that can cause serious problems (though Rock-n-Roll in itself is rarely to blame). For those times when one of these gets out of hand, you should know that New Mexico Tech offers mental health and substance abuse counseling at OCDS. The confidential services are provided free of charge by licensed professionals. Also, Socorro Mental Health can be reached at 575-835-2444. Finally – if you need to talk to someone desperately in the middle of the night, there is since July 2022 a national Crisis line available at 988.

4.2 Emergencies and Cel Phones

Cel phones should be set to vibrate during class. You are all encouraged to register your cel-phone with Tech's emergency notification system.

4.3 Mutual Respect*:

[1] New Mexico Tech supports freedom of expression as well as a respectful learning environment. As stated in the New Mexico Tech Guide to Conduct and Citizenship: "New Mexico Tech's primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community."

4.4 Disabilities and Reasonable Accommodations*:

New Mexico Tech is committed to protecting the rights of individuals with disabilities and providing access and full participation in the educational experience. Students with disabilities who require reasonable accommodations are invited to make their needs known to the Office for Student Access Services (SAS) as soon as possible. Accommodations are not retroactive and may take some time to implement. The process for requesting accommodations can be found at their website `https://www.nmt.edu/ds/academicaccommodations.php`.

You can contact SAS in person at the Fidel Center Room 245, call 575-835-6209, email access@nmt.edu or book through the link on our website.

4.5 Counseling Services*:

NM Tech offers individual and couples counseling, safety assessments, crisis intervention, outreach and consultations through the Counseling Center. These confidential services are provided free of charge by licensed professionals. Please note that changes in the delivery of counseling services may still be on going. For more information on how to access services, please call 835-6619, email counseling@nmt.edu or check out our website at `https://www.nmt.edu/cds/`.

4.6 Title IX Reporting*:

Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University's mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered "Responsible Employees" and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Tech's Title IX Coordinator (Dr. Peter Phaiah, 20D Brown Hall, 575-835-5187, titleixcoordinator@nmt.edu). Please visit Tech's Title IX Website (`www.nmt.edu/titleix`) for additional information and resources.

4.7 Student Success*:

New Mexico Tech offers numerous peer tutoring services for students who are struggling in their courses, or who just wish to receive friendly advice, including the Office of Student Learning (Skeen Library, `https://www.nmt.edu/osl/`), the Writing and Communication Lab (Skeen Library, `https://www.nmt.edu/academics/class/center.php`), and numerous department-run centers. These services are free of charge to students! Students may also consult the Associate Dean of Student Success, Elaine Debrine Howell (elaine.debrinehowell@nmt.edu) or may receive emails from her if they are struggling in class.

To read about the services a student will need to be successful visit MyNMT: `https://www.nmt.edu/mynmt.php`

Good luck, and have a great semester!

[1] All sections with *'s are boiler-plate from the Dean of Students.