COURSE INFORMATION – Spring 2026

Physics 3034: Radiation and Optics

Class: Workman 310, MWF 10:00–10:50 am

Office Hours

Tues. 15:00–17:00 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

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 geometric optics, 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

Basic understanding of geometric optics and optical systems. 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.

2 Course Expectations

Attendance I expect you to attend class. Attendance is being noted, whether I call out names or not. It is easy to tell if you miss a lot.

Homework Do it. Let the work be your own. Groups are encouraged, but not group work. Identical papers will be noted and dealt with.

Reading You are asked to read roughly one section/lecture. It is listed clearly on the separate syllabus document. There is no reading grade, but you want the textbook to be your friend.

Do not submit work done by an AI For Pete's sake, if you outsource your brain to computers now there is no hope for an interesting career. Use it as a learning resource or tutor if you like, but make sure it all runs through your brain.

3 Details and Specifications

3.1 Website

Canvas: `https://nmt.instructure.com/courses/39604`
Download problem sets and upload homework and projects here.

3.2 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.

3.3 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.)

We will also be doing one or two chapters from Pedrotti. I will post pdfs of those chapters so that you need not purchase another book.

3.4 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.

3.5 Grading

Your grade includes homework (45%), exams (45%), and a research report on a subject of your interest (10%).

3.6 Homework

Homework and its due dates are posted on Canvas. Homework must be hand written. It may be handed in during class or scanned and uploaded. Scanned submissions must be highly legible. If the scan is sideways or 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.

3.7 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.

4 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.

5 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, or in office hours. If you posted a question on Canvas and I haven't gotten to it for a day, it's OK to e-mail or text me to remind me to look at it.

Finally – if you need to talk to someone desperately in the middle of the night, there is a national Crisis line available at 988 – and you could also call me if you think I can help.

5.1 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.

6 Words from the Deans

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Student Resources: Wondering where to go for help? Please see the offices below or visit
https://www.nmt.edu/academicaffairs/Where_to_go.php

Student Success: New Mexico Tech offers numerous services for students in need of academic
assistance. This includes someone who can check their work or who could provide friendly
advice. Several locations where this assistance is available includes the Office of Student
Learning (Skeen Library, https://www.nmt.edu/osl/), Math Helproom
(https://www.nmt.edu/academics/math/ugrad/mathhelproom.php), 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 Dean for Student Success Initiatives, Elaine DeBrine Howell (Fidel, rm. 237;
575-835-5208; elaine.debrinehowell@nmt.edu) or may receive emails from her if they are
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struggling in class. Please visit the Where NMT Students Should Go For Help webpage for more information.

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://nmt.edu/ds/for_students.php.

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

Counseling Services: The Counseling Center has partnered with UWill, to provide students free, immediate access to teletherapy, a direct crisis connection, and wellness programming. UWill also offers students a direct crisis connection with help available 24/7/365. Students also have free access to on-demand wellness programming through UWill's platform, such as yoga, meditation, and mindfulness. In-person sessions on campus or this virtual healthcare are available for those degree-seeking students currently enrolled. Requests for on-campus counseling and UWill services are available on the counseling website (https://www.nmt.edu/cds/). The Counseling Center offers peer support with trained students, 'peer supporters', who understand the challenges of college and how to help navigate them. For more information on services at NMT, please call 575-835-6619, email counseling@nmt.edu.

Respect Statement: New Mexico Tech supports academic freedom and freedom of expression within the parameters of a respectful learning environment. As stated in the Student Code of Conduct Policy: \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." Furthermore, \Tech seeks to provide an environment that enables a positive learning experience and maintains an academic atmosphere that is a purposeful, just, open, disciplined, and caring community."

Sexual Misconduct & Title IX Reporting: Sexual harassment, sexual violence, sex-based discrimination, and other forms of sexual misconduct 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 and Teaching Assistants (TAs) are considered \Mandatory Reporters" 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, 238 Fidel Student Center, 575-835-5953 (O), 575-322-0001 (C), titleixcoordinator@nmt.edu), or reports can be filed online to Title IX & Sexual Misconduct Reporting Form. Please visit Tech's Title IX Website (www.nmt.edu/titleix) for additional information and resources.

RAVE Emergency Alert System:
New Mexico Tech's RAVE Emergency Alert System may reach students via cell phone voice and text and also via email (depending on what they sign up to receive). Emergency Notifications are issued for any special situations that concern campus safety, such as severe weather advisories, special instructions due to street closures and emergency instructions that will tell students what to do and where to proceed in the event of an emergency. This will allow students to stay safe and keep them out of harm's way as a situation is happening or to stay clear of an incident scene.

Students may sign up here (https://www.getrave.com/login/nmt). If you need more information on how to sign up for RAVE Emergency Alert System, please visit: https://www.nmt.edu/police/rave.php.

Good luck, and have a great semester!