

ECE 577: Fundamentals of Semiconductor LEDs and Lasers

Spring 2026

Instructor: Prof. Daniel Feezell

Office Location: CHTM 112B

Office Hours: After class or by appointment

Class Meeting Day(s): Tu-Th

Class Location / Room: CHTM Room 103

Email: dfeezell@unm.edu

Office Phone: 505-272-7823

Course Credits: 3

Class Time: 2:00 pm - 3:15 pm

Term / Semester: Spring 2026

Class Website:

<https://canvas.unm.edu/>

I will post the syllabus, homework assignments and solutions, projects, lecture slides, and other course materials. The website requires you to login using your UNM NetID. A detailed course schedule is also available on the course website. This schedule includes the material to be covered, recommended sections of the book for reading, exam dates, and HW assignments and due dates. Please note that the schedule is approximate.

Course Description: Semiconductor lasers are key components in a variety of applications, including optical communications, LIDAR, directed energy, high-density optical data storage, sensing, atomic clocks, displays, and future lighting systems. By the end of the course, you should be able to design and analyze a variety of semiconductor laser structures. Topics to be covered may include: carrier generation and recombination, photon generation and loss in laser cavities, LED internal quantum efficiency, LED extraction efficiency, density of optical modes and blackbody radiation, radiative and non-radiative processes, distributed Bragg reflectors, DBR and DFB lasers, optical gain, spontaneous and stimulated emission, Fermi's golden rule, gain and current/carrier relations, characterization of diode lasers, rate equations, small and large signal analysis, VCSELs.

Required Textbook: "Diode Lasers and Photonic Integrated Circuits," L. Coldren, S. Corzine, and Milan Masanovic, John Wiley & Sons Inc., 2nd edition (2012), ISBN: 0470484128.

Reference Textbooks: "Physics of Photonic Devices," S. L. Chuang, John Wiley & Sons Inc., 2nd edition (2012), ISBN: 0470293195

"Optoelectronics and Photonics: Principles and Practices," S. O. Kasap, Prentice Hall, 1st Edition (2001), ISBN: 0201610876.

Prerequisites:

Background in semiconductor physics (e.g., ECE 471/571 or ECE 572) and optoelectronics (e.g., ECE 475/575 or ECE 570), or permission from instructor.

Grading:

Homework (there will be 5-6 homework assignments, see homework policy)	10%
Midterm Exam (Thursday 3/12/26)	25%
Video Lecture Project (Thursday 3/26/26)	15%
VCSEL Design Project (Due Thursday 5/7/26)	25%

Homework Policy:

Homework will be graded primarily on demonstrated effort and engagement with the course material. Evidence of effort may include clear and well-documented written solutions, participation in class discussions, and engagement through office hours or other instructional interactions.

Homework is assigned to support your learning and to prepare you for the midterm exam, final exam, and course projects. Its primary purpose is to deepen your understanding of the course material and strengthen problem-solving skills, rather than to serve as a means of inflating your course grade.

Late homework assignments will typically not be accepted as I will post the solutions to the assignments right after you turn them in. Homework is due at the *beginning* of the class period on the due date. Homework should be neatly written, with each problem labeled and the pages stapled together. Show your work in a logical fashion in order to get maximum credit and ***please box your final answers!*** If the problem says “plot” you should use Excel, Matlab, or some other numerical tool, if the problem says draw or sketch, you can do it by hand.

AI Statement:

You may use AI tools (such as ChatGPT, Copilot, or Gemini) to help you learn in this course. Some examples include reviewing background concepts, checking your math/numbers, or clarifying terminology. However, the final work you turn in must be your own. If you use AI in a way that contributes directly to your homework or projects, you need to note that clearly at the end of your assignment (including the tool you used and a brief description of how you used it). Using AI to produce lengthy derivations, full solutions, or extensive amounts of text without acknowledgement is forbidden and will be treated as an academic integrity violation.

Credit-hour statement: This is a three-credit-hour course. Class meets for two 75-minute sessions of direct instruction for fifteen weeks during the Spring 2025 semester. Please plan for a minimum of six hours of out-of-class work (homework, studying, assignment completion, and/or class preparation) each week.

Attendance Policy: Regular and punctual attendance is required. UNM Pathfinder policies apply, which in part means instructor drops based on non-attendance are possible. This policy applies regardless of the grading option you have chosen.

Accommodations: UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center (<https://arc.unm.edu/>) at arcsrvs@unm.edu or by phone at 505-277-3506.

Title IX: The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University’s programs and activities, including the classroom, should always provide a space of

mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (<https://loborespect.unm.edu>), the Women's Resource Center (<https://women.unm.edu>), and the LGBTQ Resource Center (<https://lgbtqrc.unm.edu>). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see <https://policy.unm.edu/university-policies/2000/2740.html> and CEEO's [website](#).

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights.

Student Support: Confidential services for students are available at [LoboRESPECT Advocacy Center](#), [Women's Resource Center](#), and the [LGBTQ Resource Center](#). The [Women's Resource Center](#) supports all students, including those who are pregnant or are parents. UNM's lactation stations are marked on the [UNM campus map](#).

Student Support: Resources to support study skills and time management are available through [Student Learning Assistance](#) at the Center for Teaching and Learning in Zimmerman Library or online.

Responsible Learning and Academic Honesty: Cheating and plagiarism (academic dishonesty) are often driven by lack of time, desperation, or lack of knowledge about how to identify a source. Communicate with me and ask for help, even at the last minute, rather than risking your academic career by committing academic dishonesty. Academic dishonesty involves presenting material as your own that has been generated on a website, in a publication, by an artificial intelligence algorithm (AI), by another person, or by otherwise breaking the rules of an assignment or exam. It is a [Student Code of Conduct](#) violation that can lead to a disciplinary procedure. When you use a resource (such as an AI, article, a friend's work, or a website) in work submitted for this class, document how you used it and distinguish between your original work and the material taken from the resource.

Cell Phones and Technology: As a matter of courtesy, please turn off cell phones, pagers, and other communication and entertainment devices prior to the beginning of class. Notify me in advance if you are monitoring an emergency, for which cell phone ringers should be switched to vibrate.

Library and Tutorial Services: UNM-Main campus provides many library services and some tutorial services for distance students. For library services, go to <http://www.unm.edu/libraries/>

to link to a specific library or to contact a librarian. For tutorial services, go to <http://caps.unm.edu/online> to explore UNM's online services.

COVID-19 Health and Awareness: UNM is a mask friendly, but not a mask required, community. To be registered or employed at UNM, Students, faculty, and staff must all meet UNM's [Administrative Mandate on Required COVID-19 vaccination](#). If you are experiencing COVID-19 symptoms, please do not come to class. If you have a positive COVID-19 test, please stay home for five days and isolate yourself from others, per the [Centers for Disease Control \(CDC\) guidelines](#). If you do need to stay home, please communicate with me at dfeezell@unm.edu; I can work with you to provide alternatives for course participation and completion. UNM faculty and staff know that these are challenging times. Please let us know that you need support so that we can connect you to the right resources and please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

[Student Health and Counseling](#) (SHAC) at (505) 277-3136. If you are having active respiratory symptoms (e.g., fever, cough, sore throat, etc.) AND need testing for COVID-19; OR If you recently tested positive and may need oral treatment, call SHAC. [LoboRESPECT Advocacy Center](#) (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

COVID-19 Symptoms and Positive Test Results: Please do not come to a UNM campus if you are experiencing symptoms of illness or have received a positive COVID-19 test (even if you have no symptoms). Contact your instructors and let them know that you should not come to class due to symptoms or diagnosis. Students who need support addressing a health or personal event or crisis can find it at the [Lobo Respect Advocacy Center](#).

Communication on Change in Modality: The President and Provost of UNM may direct that classes move to remote delivery at any time to preserve the health and safety of the students, instructor and community. The instructor will provide any updates about our class and please check <https://bringbackthepack.unm.edu> regularly for general UNM updates about COVID-19 and the health of our community.

Weather Policy: In the event of severe weather conditions UNM may close. Please call 277-SNOW to check UNM's status during questionable weather conditions.

Copyright Policy and Law: *(University Counsel's Office - Subject to Change Without Notice)*
The unauthorized distribution of copyrighted material, including through peer-to-peer file sharing, may subject a student to criminal and civil penalties. The laws that govern copyright are not specific to any one technology. Students can violate the rights of a copyright holder using many different types of technology. Both uploading and downloading of files can pose a violation of the copyright law. Students should be cautious when obtaining any copyrighted material. As a rule of thumb, before a student receives anything for free, they should research whether that source provides material licensed by the copyright owner. A group called EDUCAUSE has a list of legal file sharing alternatives at <http://www.educause.edu/legalcontent>.

Individuals who violate copyright law by illegally uploading and downloading copyrighted files may be subject to civil penalties of between \$750 and \$150,000 per song. These penalties are

established by federal law. In the past, pre-litigation settlements offered by copyright owners have been in the \$3,000 to \$4,000 and up range while juries in some jurisdictions have issued verdicts of hundreds of thousands and up. In addition, a court may, in its discretion, grant the copyright owner reasonable attorney fees. Although criminal prosecution of students for file sharing is extremely rare, federal law lays out criminal penalties for intentional copyright infringement which can include fines and jail time. In addition to potentially violating the law, unauthorized distribution or receipt of copyrighted material is a violation of University Business Policies and Procedures Manual 2500. That policy states that: "Users shall respect all copyrights including software copyrights...Use of University computing services in violation of applicable laws or University policy may result in sanctions, including withdrawal of use privilege; disciplinary action, up to and including, expulsion from the University or discharge from a position; and legal prosecution under applicable federal and/or state law."