

Introduction to Partial Differential Equations - MATH 463/513: Spring 2024

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Course web page:

math.unm.edu/~plushnik/teaching/math513spring2024

Textbook (optional): Partial Differential Equations, (Second edition) by Lawrence C. Evans, ISBN-10: 0821849743

1. Derivation of basic Partial Differential Equations (PDE) from physical problems. Heat, wave and Laplace equations. The nonlinear Schrodinger and Klein-Gordon equations. Well-posed problems and classical solutions. Weak solutions. Elementary solution techniques of PDE. Method of separation of variables and transform methods.
2. First order quasilinear and nonlinear PDE. The method of characteristics.
3. Cauchy-Kovalevskaya Theorem.
4. Hyperbolic equations. The wave equation in dimension one (1D) and multi-D. D'Alembert's solution. Solution of mixed initial-boundary problems. The method of reflection. Propagation of singularities. The energy principle.
5. Fourier series and integrals.
6. Elliptic equations. Laplace and Poisson equations. Fundamental solutions and Green's functions. The Dirichlet and Neumann problems. Elementary properties of harmonic functions. Maximum principle. Potential theory. Variational formulations.
7. Parabolic equations. The heat equation. Fundamental solution. Solution of initial value problem. Solution of mixed initial-boundary value problems. The method of reflection. Duhamel's principle. Elementary properties of solutions of the heat equation. Maximum principles. The Burgers equation. Cole-Hopf transform.

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 at arcsrvs@unm.edu or by phone at 505-277-3506.

Support: Contact me and contact Accessibility Resource Center (<https://arc.unm.edu/>) at arcsrvs@unm.edu or (505) 277-3506.

Credit-hour statement (alter as needed to suit your section):

This is a three credit-hour course. Class meets for two 75-minute sessions of direct instruction for fifteen weeks during the Spring 2024 semester. Please plan for a *minimum* of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

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

Title IX:

[Note: UNM encourages faculty and TAs to include a Title IX statement on the syllabus and reminds faculty, TAs, and GAs that per university policy UAP 2740 they are required to report gender discrimination, including sexual harassment, sexual misconduct and sexual violence to the Title IX Coordinator at the [Office of Compliance, Ethics and Equal Opportunity](#). Information about how to have a conversation with a student about reporting and what steps to take is available on the [Title IX Coordinator page](#). The Ombuds for Staff runs workshops on that include handling disclosures of sexual harassment (<https://ombudsforstaff.unm.edu/professional-development/index.html>). Faculty may be interested in informational resources, including language that could be used on a syllabus for referral to support services, developed by a group of UNM faculty, [Faculty for a Sexual Assault Free Environment at UNM \(Faculty SAFE\)](#).]

To meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees.” This designation requires that any report of gender discrimination, which includes sexual harassment, sexual misconduct and sexual violence, made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office Compliance, Ethics and Equal Opportunity (ceeo.unm.edu). For more information on the campus policy regarding sexual misconduct and reporting, see: <https://policy.unm.edu/university-policies/2000/2740.html>.

OR

Our classroom and our university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have

concerns about incidents that violate this principle, please access the resources available to you on campus. Please note that, because UNM faculty, TAs, and GAs are considered "responsible employees" any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct and reporting, please see: <https://policy.unm.edu/university-policies/2000/2740.html>.

Support: [LoboRESPECT Advocacy Center](#), the [Women's Resource Center](#), and the [LGBTQ Resource Center](#) all offer confidential services.

Land Acknowledgement: Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.

Faculty Resource: Information provided by UNM's Division for Equity and Inclusion can support building an inclusive classroom, <https://diverse.unm.edu/education-and-resources/programs/index.html>.

Citizenship and/or Immigration Status: All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: <http://undocumented.unm.edu/>.

Responsible Learning and Academic Honesty: We all have shared responsibility for ensuring that learning occurs safely, honestly, and equitably. Submitting material as your own work that has been generated on a website, in a publication, by an artificial intelligence algorithm (AI), by another person, or by breaking the rules of an assignment constitutes academic dishonesty. It is a student code of conduct violation that can lead to a disciplinary procedure. *Please ask me for help in finding the resources you need to be successful in this course. I can help you use study resources responsibly and effectively.* Off-campus paper writing services, problem-checkers and services, websites, and AIs can produce incorrect or misleading results. Learning the course material depends on completing and submitting your own work. UNM preserves and protects the integrity of the academic community through multiple policies including policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the *Student Pathfinder* (<https://pathfinder.unm.edu>) and the *Faculty Handbook* (<https://handbook.unm.edu>).

Support: Many students have found that time management workshops or work with peer tutors can help them meet their goals. These and are other resources are available through [Student Learning Support](#) at the Center for Teaching and Learning.

Respectful Conduct Expectations: I am committed to building with you a positive classroom environment in which everyone can learn. I reserve the right to intervene and enforce standards of respectful behavior when classroom conduct is inconsistent with University expectations [and/or classroom community agreements]. Interventions and enforcement may include, but are not limited to, required meetings to discuss classroom expectations, written notification of expectations, and/or removal from a class meeting. Removal from a class meeting will result in an unexcused absence. 3 or more unexcused absences may result in permanent removal and a drop from the course (see attendance policy). The University of New Mexico ensures freedom of academic inquiry, free expression and open debate, and a respectful campus through adherence to the following policies: [D75: Classroom Conduct](#), [Student Code of Conduct](#), [University Policy 2240 – Respectful Campus](#), [University Policy 2210 – Campus Violence](#).

[Attendance and late work policies: As you craft your attendance policy, consider three things: 1) you can offer excused absences and differentiate them from unexcused absences; 2) if you use the 'respectful conduct expectations,' (see above), your attendance policy will need to be coordinated with it; 3) you can provide some flexibility for students experiencing unforeseen circumstances while also making sure that they complete work in a way that allows you to provide timely feedback and that allows them to progress during the semester. Some faculty address flexibility by providing, for example, one opportunity for a dropped quiz grade or one late submission of an assignment without penalty. This decision tree, developed at by Katherine Castle at University of Nebraska-Lincoln, may help you assess flexibility levels: <https://cas.unl.edu/decision-tree-student-request-flexibility>.]

Connecting to Campus and Finding Support: UNM has many resources and centers to help you thrive, including [opportunities to get involved](#), [mental health resources](#), [academic support such as tutoring](#), [resource centers](#) for people like you, free food at [Lobo Food Pantry](#), and [jobs on campus](#). Your advisor, staff at the [resource centers](#) and [Dean of Students](#), and I can help you find the right opportunities for you.

Wellness: If you do need to stay home due to illness or are experiencing a wellness challenge, please let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. UNM is a mask friendly, but not a mask required, community. If you are experiencing COVID-19 symptoms, please do not come to class.

Support:

[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.

[TimelyCare](#): Free 24/7 virtual care services (medical, emotional support, health coaching, self-care, basic needs support. Go to <http://timelycare.com/unm>.

[LoboRESPECT Advocacy Center](#) (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

Instructors across UNM campuses have boosted academic outcomes and positive engagement by drawing on the [Student Experience Project](#)—a UNM-tested and research-based approach to building an inclusive classroom. You can find SEP practices in the [SEP Resource Hub](#), including information in the [First Day Toolkit](#) on designing a welcoming and equitable syllabus.