**Instruction style:** Remote instruction;

- Pre-recorded lecture videos and slides/notes will be made available
- Live Zoom open question time: TuTh 11:00am-12:00pm
  Link: https://unm.zoom.us/j/93285695111

**Instructor:** Mohammad Motamed, Associate Professor of Applied Mathematics

**Course webpage:** http://www.math.unm.edu/~motamed/Teaching/S21/513/math513.html

**Contact:** motamed@unm.edu (the title of your email must be **513**)

**If you need extra help outside live Zoom open question time:**

1. First, you will need to notify the instructor by email (motamed@unm.edu) via your unm e-mail address and request for an appointment. The title of all your emails must be **513**. Please do not use other titles, such as "question", "need appointment", "late homework", "missing Zoom", etc.
   In your email, you will need to provide the instructor with the following information:
   - a few time slots and dates when you will be available so that the instructor can find a time that would work for him and you.
   - a method for discussion that you feel comfortable with. Examples include: Zoom and MS Teams.
2. Then, the instructor will work with you to set up a time and a method so that you and the instructor can meet and discuss.

**Required Text:** L. C. Evans, Partial Differential Equations, American Mathematical Society, 1st or 2nd Ed.

**Description:** This is an introductory graduate-level course on the theory of PDEs. We will closely follow parts of the first four chapters of the text, covering the following topics:

- Definition and classification of PDEs. Derivation of elementary PDEs from physical problems. Elementary solution techniques for PDEs.
- Elliptic equations. Laplace and Poisson equations. Fundamental solutions and Green's function. The Dirichlet and Neumann problems. Elementary properties of harmonic functions. Maximum principle. Potential theory. Variational formulations.
- Parabolic equations. The heat equation. Fundamental solutions. Solution of the initial value problem. Solution of mixed initial-boundary value problems. Duhamel's principle. Elementary properties of solutions of the heat equation. Maximum principle.
- Hyperbolic equations. The wave equation in 1-D and Multi-D. D'Alambert's solution. Solution of mixed initial-boundary value problems. The method of reflection. Propagation of singularities. The energy principle.

- First order quasilinear and nonlinear PDEs. Complete integrals and envelopes. The method of characteristics. Hamilton-Jacobi PDEs. Weak solutions and uniqueness.
- Other solution techniques: method of separation of variables, method of eigen-function expansion, Fourier-Laplace transform methods.
- Additional topics in PDEs at the instructor's discretion and depending on time and student interest. Potential topics include:
  - Conservation laws
  - Asymptotics: geometric optiocs and homogenization

**Required background:** We will be heavily using calculus and linear algebra. You should also have been exposed to and feel comfortable with undergraduate-level PDEs, e.g. Math 312 at UNM or equivalent.

**Grading:** Your grade will be determined based on homework (**1000 points**). Letter grades will then be assigned according to the following scheme: A+/A, 980/900 points or above, B+/B, 880/800 points or above, C+/C, 780/700 points or above, F below 700 points. The instructor reserves the right to "curve" grades to offset unforeseen circumstances. The curving of grades will never decrease a student's letter grade below that given by the above formula.

**Homework:** We will have **seven** homework assignments. Each homework will consist of a number of questions. You need to submit your report by uploading a PDF-file on UNM Learn by the due date. You may work with your peers on the homework, but you must hand in all solutions in your own words. Late homework is not accepted unless you have a valid reason. If you are to miss a homework due date, you will need to talk to me in advance.

**Dishonesty Policy:** Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, including dismissal, against any student who is found responsible for academic dishonesty. Any student who has been judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course. Academic dishonesty includes, but is not limited to, dishonesty on quizzes, tests or assignments; claiming credit for work not done or done by others; and hindering the academic work of other students.

**American Disabilities Act:** In accordance with University Policy 2310 and the American Disabilities Act (ADA), students who need academic accommodations and/or assistance in emergency evacuations should contact me as soon as possible to ensure their needs are met in a timely manner. It is imperative that you take the initiative to bring such needs to the instructor's attention, as the instructor is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Services at 505-661-4692 for additional information.

**Title IX:** In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education (see page 15 - http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf). 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 of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct, see: https://policy.unm.edu/university-policies/2000/2740.html

**COVID-19:** Please refer to `https://www.unm.edu/coronavirus/` for UNM resources on COVID-19.

**Disclaimer:** I reserve the right to make reasonable and necessary changes to the policies outlined in this syllabus. Whenever possible, the class will be notified in advance of such changes. An up-to-date copy of the syllabus can always be found on the course website. You need to regularly check the course website for possible updates. It is **your responsibility** to know and understand the policies discussed therein and to be up-to-date. If in doubt, ask questions.