FALL 2019 - MATH 678
PARTIAL DIFFERENTIAL EQUATIONS

Lectures: Mo 7:20 pm - 10:00 Exploratory Hall 4106

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Prerequisites. Undergraduate linear algebra, ODE and certain knowledge of undergraduate PDEs. Even though this is an introductory course, it still requires a considerable amount of comfort with advance mathematical concepts, especially as the semester progresses.

Text. I recommend to buy (or borrow) [1, 2] and also use [3] as a reference.

Description. This course considers both theory and applications and it is aimed at students with different background. The course describes how to derive various PDEs from applications and how to numerically solve them. Though latter is not the primary focus of the course but it motivates the need for theory. We shall focus on Poisson equation, heat equation, and if time permits on wave equation. Different mathematical tools will be considered: fundamental solutions, Green's functions, maximum principles, energy principles etc. Both the notion of strong and weak (variational) solution will be discussed.

Exams (50%): Mid term (20%) and final (30%). The FINAL exam / project will be comprehensive.

Homework (50%): There will be regular homeworks and will amount to 50% of the final grade. There will be a penalty of 10% per day late; homeworks will not be accepted after one week.

Students are encouraged to work in groups of up to three students but must hand in an individual self written proofs and answers.

Academic Integrity: GMU is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Mason email accounts. Students must use their MasonLIVE email account for any correspondence during this course. For more information see: `http://masonlive.gmu.edu`.

Office of Disability Services. If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474, `http://ods.gmu.edu`. All academic accommodations must be arranged through the ODS.

University policies. The University Catalog, `http://catalog.gmu.edu`, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at `http://universitypolicy.gmu.edu`. All members of the university community are responsible for knowing and following established policies.

References

[1] L.C. Evans. *Partial differential equations*, volume 19 of *Graduate Studies in Mathematics*. American Mathematical Society, Providence, RI, 1998.

[2] R. B. Guenther and J. W. Lee. *Partial differential equations of mathematical physics and integral equations*. Dover Publications, Inc., Mineola, NY, 1996. Corrected reprint of the 1988 original.

[3] Francisco-Javier Sayas, Thomas S. Brown, and Matthew E. Hassell. *Variational techniques for elliptic partial differential equations*. CRC Press, Boca Raton, FL, 2019. Theoretical tools and advanced applications.