MATH 483/683: Partial Differential Equations: 3 credits

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WEB https://www.ndsu.edu/pubweb/~novozhil/
https://www.ndsu.edu/pubweb/~novozhil/Teaching/math483.html

ONLINE EVAL https://www.ndsu.edu/pubweb/~novozhil/Teaching/evaluation_form.htm
You can use this form to submit anonymous comments any time during the course.

PHONE (701) 231-8680

LECTURE HOURS MWF 10:00am–10:50am, NDSU Dolve Hall Room 10

OFFICE HOURS MWF 2:00pm–3:00pm (or by appointment)

TEXTBOOK P. Olver, Introduction to Partial Differential Equations, Springer, 2014

PREREQUISITES MATH 266: Introduction to Ordinary Differential Equations

COURSE DESCRIPTION First and second order partial differential equations, classification, examples, solution methods for the wave, diffusion, and Laplace equations, causality and energy, boundary value problems, separation of variables, Green's identities, Green's functions.

COURSE OBJECTIVES Partial differential equations (PDE) are among the main tools of applied mathematics that are used to model various processes in physics, engineering, economics, natural and social sciences. The purpose of the course is to learn the basics of the theory of linear PDE and master the elementary tools (Fourier series, integral transforms, Green's functions) to solve three most important linear partial differential equations: the heat, wave, and Laplace equations. The students will be exposed to both theoretical and applied points of view.

CLASS ATTENDANCE Class attendance is expected. The students are solely responsible for missed handouts or announcements made during the lectures.

HOMEWORK Starting week two of the course there will be a regular weekly homework. No late homework will be accepted. Group work on homework problems is encouraged, however, the final writing of solutions should be entirely your own (LaTeX is preferred but not required).

EXAMS There will be three midterm tests and a comprehensive final exam at the end of the semester. Make-ups for the midterm tests are possible in case of a legitimate (documented) excuse. Please contact me well in advance to arrange for a make-up. No make-ups for the final exam (May 11th, 10:30am–12:30am).

GRADING

The final grade will be the maximum out of the final grade and the average across the semester, where the weighting of grades will be the following:

- Homework average............30%

- Midterm test (each)..........15%

- Final Exam.......................25%

To be precise, let H be the homework average ($0 \leq H \leq 100$), $0 \leq M_i \leq 100$ be the scores for the midterm tests, here $i = 1, 2, 3$, and $0 \leq E \leq 100$ be the score for the final exam. The final grade will be calculated as

$$\max\{E, 0.3H + 0.15M_1 + 0.15M_2 + 0.15M_3 + 0.25E\}.$$

The final grade will be A/B/C/D/F with the thresholds 90/80/70/60

ACADEMIC RESPONSIBILITY AND CONDUCT

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Any student found guilty of academic dishonesty will receive a grade of 0 for the homework assignment, or quiz, or exam in question. In addition, every such student will be reported to the Chair of Mathematics, the Dean of their major college, the Dean of the College of Science and Mathematics, the Provost, and the Registrar. The Registrar will add any such student to NDSU's Student Academic Misconduct Database. (Multiple entries in this database may result in additional sanctions from NDSU.)

SPECIAL NEEDS

Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible.

SCHEDULE

Note: This is a tentative schedule and subject to a change. Week 1 starts January 12th.

Week 1. Introduction. What are PDE?

Week 2. Linear waves. Transport equation.

Week 3. The wave equation. d'Alembert's formula.

Week 4. The wave equation (cont.). First midterm test.

Week 5. The heat equation. Fourier series.

Week 6. Convergence of Fourier series. Hilbert space.

Week 7. Separation of variables.

Week 8. Separation of variables (cont.).

Week 9. Separation of variables (cont.). Second midterm test.

Week 10. Spring break, no classes.

Week 11. Delta-function and Green's function.

Week 12. Green's function (cont.). Fourier transform.

Week 13. Fourier transform (cont.). Fundamental solution to the heat equation.

Week 14. Laplace transform. Third midterm test.

Week 15. Planar heat and wave equations.

Week 16. Planar heat and wave equations (cont.).

Week 17. Planar heat and wave equations (cont.). Review classes. Dead week.

Week 18. Final exam (May 11th, 10:30am–12:30am).