Mathematics 5440
Introduction to Partial Differential Equations
Autumn Semester 2007
MWF 10:40-11:35, LCB 222

Instructor
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1 Course description

The course will be an introduction to the study of partial differential equations, one of the central areas of mathematics and applied mathematics. We shall first derive several of the partial differential equations of classical physics (the wave and heat equations and the equations of potential theory), proceed to classification schemes and then develop methods for the solution of such equations. These methods will be employed to solve various boundary value problems associated with the equations mentioned above in two and higher dimensions. An integral part of the latter will be a study of Fourier series and generalizations of such. Time permitting we shall also have an introduction to the study of functions of one complex variable and Fourier transforms.

2 Text

There are many excellent texts (several are listed below) on the subject and I have chosen the text:

- H. F. Weinberger: A First Course in Partial Differential Equations with Complex Variables and Transform Methods, Dover Publications, New York, 1995 (original edition by Blaisdell, New York, 1965).

This text has become a classic in the field and has also the advantage that it is inexpensive (students may find a contact with internet booksellers useful, as they sell the text cheaper than the bookstore and have a quick delivery time). We shall follow this text closely. At times supplementary material will be provided.

3 Grades, examinations, home work

During each class period home work will be assigned. Such assignments are to be turned in for grading on a weekly basis (assignments made on MWF of a given week will be collected the following M). There will also be two examinations plus one final examination. The grade for the course will be determined as a weighted average of the grades received on the two mid term examinations, the final examination and the home work. The individual grades will be weighted as follows:

- Final examination: 30%
- Examination 1: 20%
- Examination 2: 20%
- Home work: 30%

(In writing solutions to examination questions and home work problems student should take immense care to practice their writing skills and should provide ample details explaining the various steps performed.)

4 Additional texts

1. N. Asmar: Partial Differential Equations and Boundary Value Problems, Prentice Hall, Upper Saddle River, NJ, 2000. (Similar level.)

2. R. Courant and D. Hilbert: Methods of Mathematical Physics, vols. 1 and 2, Wiley-Interscience, New York, 1962. (More advanced, a classic!)

3. C. Edwards and D. Penny: Differential Equations and Boundary Value Problems, Prentice Hall, Upper Saddle River, NJ, 1996. (More elementary.)

4. P. Garabedian: Partial Differential Equations, Wiley, New York, 1964. (More advanced.)

5. R. Haberman. Elementary Applied Partial Differential Equations, Prentice Hall, Upper Saddle River, NJ, 1998. (More elementary.)

6. F. John: Partial Differential Equations, Springer, New York, 1982. (More advanced.)

7. D. Logan: Applied Partial Differential Equations, Springer, New York, 1998. (Similar level.)

8. M. Pinsky: Introduction to Partial Differential Equations with Applications, Mc-Graw Hill, New York, 1984.

9. W. Strauss: Partial Differential Equation an Introduction, Wiley, New York, 1992. (Similar level.)

10. J. Troutman: Boundary Value Problems of Applied Mathematics, PWS Publishing, Boston, 1994. (More elementary.)

11. E. Zauderer: Partial Differential Equations of Applied Mathematics, 3rd edition, Wiley, Hoboken, 2006. (Similar level.)