Department of Mathematics & Statistics

Partial Differential Equations

Course Content

1. Introduction to PDE. Linear, Quasilinear, Semi linear and non linear equations.
2. First order Equations. The Cauchy problem for Quasi linear equations. Method of Characteristics. General Solutions, Lagrange's method. General non-linear equations. Complete integrals and general solutions.
3. Higher order equations and their classification. The Cauchy problem. Cauchy-Kovaleski Theorem.
4. Second order equations. Classification by characteristics. Canonical forms and general solutions.
5. Wave Equation. One-dimensional wave equation. Initial and boundary value problem. The non-homogenous equation. Higher dimensions. Spherical means. Three dimensional wave equation. The two dimensional wave equation. Huygens's principle.
6. Laplace Equation. Introduction. Separation of variables. Initial and Boundray value problems. Green's identity and uniqueness of solution. Mean value and maximum principle. Fundamental solution. Green's function and the poisson kernel. The Dirichlet problem on upper half plane. The Dirichlet problem on a ball. Harmonic functions. Eigenvalues of the Laplacian. Eigenvalues and the Eigenfunction expansion. Application to the wave equation.
7. The Heat Equation. The heat equation in a bounded domain. Existence of solutions by eigenfunction expansion. The maximum principle and uniqueness. Initial value problems.
8. References
    - Robert C McOwen: Partial Differential Equations, Pearson Education Inc.
    - Alan Jeffrey, Applied Partial Differential Equations, Academic Press.
    - T Amaranath, An Elementary Course in Partial Differential Equations, Narosa Publishers.
    - Ervin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons.

This is the outline I am planning. How much of this can be covered will depend on your active participation in the course.

Attendance and grading policy

Attendance will be taken using biometric system. You should have a minimum of 80% attendance to appear for the end-semester examination. If you can't come to the class in time, don't come.

Grading policy

1. There will be three quizzes and the best two will be considered with weightage of 10% each. These quizzes will be announced quizzes.
2. Mid-Semester will have 30% weightage and the end-semester will have 50% weightage.
3. Grades will be awarded as per the following scheme: Any student with less than 40% will get F grade. Students with marks in the range 40% to 50% will be awarded D grade. Students with marks in the range 51% to 60% will be awarded C grade. Students with marks in the range 61% to 74% will be awarded B grade. Students with marks 75% or more will get A grade. The grade A* will be awarded to exceptionally good students.