SYLLABUS FOR MASTER’S COMPREHENSIVE EXAMINATION
PARTIAL DIFFERENTIAL EQUATIONS

Department of Mathematics and Statistics
California State University, Long Beach

Topics

1. First-order equations (Cauchy problem for quasi-linear and fully non-linear equations; Formation of singularities, weak solution, application to traffic flow; Constant–coefficient first–order hyperbolic systems).

2. General techniques and principles for second–order equations (Canonical forms; Separation of variables; Fourier series, sine series, and cosine series; Eigenfunction expansion; Duhamel’s principle).

3. The Laplace equation (Mean Value Theorem and Maximum Principle; Fundamental solution, Green’s function, Poisson kernel; Method of images (or reflections); Eigenvalues and eigenfunctions of the Laplacian.)

4. The wave equation (d’Alembert’s formula; Reflections; Two–dimensional and three–dimensional wave equation; Conservation of energy).

5. The heat equation (Weak maximum principle; Properties of the heat kernel; Properties of the solution to the pure initial value problem).

References


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