Masters-Ph.D. Qualifying Exam Partial Differential Equations Syllabus

Topics:

- Derivation of elementary P.D.E.s from physical problems: heat, wave and Laplace's
 equation. Elementary solution techniques for P.D.E.s. Method of separation of
 variables and transform methods. Fourier series and integrals. Physical
 applications.
- 2. First order quasilinear and nonlinear P.D.E.'s. The method of characteristics.
- Hyperbolic equations. The wave equation in 1-D and Multi-D. D'Alembert's solution. Solution of Mixed initial-boundary problems. The method of reflection. Propagation of singularities. The energy principle.
- 4. Elliptic equations. Laplace and Poisson equations. Fundamental solutions and Green's functions. The Dirichlet and Neumann problems. Elementary properties of harmonic functions. Maximum principle. Potential theory. Variational formulations.
- Parabolic equations. The heat equation. Fundamental solution. Solution of initial value problem. Solution of mixed initial-boundary value problems. The method of reflection. Duhamel's principle. Elementary properties of solutions of the heat equation. Maximum principles.

References:

- 1. Carrier, G. and Pearson, C., Partial Differential Equations, Theory and Technique.
- 2. Chester, C., Techniques in Partial Differential Equations.
- 3. Colton, E, Partial Differential Equations.
- 4. Courant, R. and Hilbert, D., Methods of Mathematical Physics.
- 5. Garabedian, P., Partial Differential Equations.
- 6. John, F., Partial Differential Equations.
- 7. Zachmanglou, E. and Thoe, D., Introduction to Partial Differential Equations with Applications.
- 8. Zauderer, E., Partial Differential Equations of Applied Mathematics.
- 9. Copson, E.T., Partial Differential Equations.
- 10. Epstein, B., Partial Differential Equations.
- 11. Lax, P.D., Hyperbolic Systems of Conservation Laws and the Mathematical Theory of Shock Waves.
- 12. Pinsky, M.A., Partial Differential Equations and Boundary-Value Problems with Applications.
- 13. Petrovsky, I., Lectures on Partial Differential Equations.
- 14. Sneddon, I.N., Elements of Partial Differential Equations.
- 15. Street, R.L., Analysis and Solution of Partial Differential Equations.
- 16. Tikhonov, A. and Samarski, A.A., Equations of Mathematical Physics.