IIT Dharwad
Autumn 2019

Engineering Mathematics for Advanced Studies

Syllabus - Module: Partial Differential Equations

Syllabus -

1. Important linear PDEs
2. Ability to mathematically express real life problem as a PDE (with BCs)
3. Typical boundary conditions
4. Classification of second order PDEs (elliptic, parabolic, hyperbolic); use of Hessian martix
5. Conceptual understanding of Fourier Series/Fourier integrals
6. Wave equation:
    a. Derivation of 1D wave equation using force and accelerations
    b. Understanding of the role of constants, parameters used in derivation
    c. Familiarity with working with prescribed boundary conditions and initial conditions
    d. Solution using separation of variables
    e. D'Alembert's solution of wave equation
7. Heat equation
    a. Use of separation of variables/Fourier series for Heat equation in 1D problem
    b. Understanding of the role of constants, parameters used in derivation
    c. Familiarity with working with prescribed boundary conditions and initial conditions
    d. Steady state 2D heat flow
8. Expression of PDEs in cartesian spherical, cyllindrical, polar coordinates
9. Use of separation of variables in different coordinate systems
10. Transformation of variables to facilitate separation of variables (No emphasis on memorization of transformation is expected; instead ability to implement/verify proposed plausible transformation is expected)
11. Conceptual understanding of use of similarity variables for solving PDEs

Skipped/superficially discussed in class but important relevant topics which are betters covered in other modules of the course-
Fourier Transforms
Laplace Transforms