

**Catalog Description:** The third course in a three term sequence. Applications of linear and weakly nonlinear partial differential equations. Analytical solution techniques for parabolic, elliptic, and hyperbolic equations. Green's functions, integral methods, shocks, and the method of characteristics.

**Course Objectives:** Upon successful completion of this course a student should have a working understanding of:

1. Application of Green's function in the analysis of PDE's.
2. The use of the Method of Characteristics in the solution of PDE's.
3. Optional topics on different solution methods.
4. In depth presentation of an application of PDEs.

### **Learning Outcomes and Performance Criteria**

1. Green's Functions
  - (a) Green's Function for time-independent problems (Poisson's equation)
  - (b) Fredholm's alternative
  - (c) Green's Function for time-dependent problems (wave and heat equations)
2. Method of Characteristics
  - (a) Analysis of first order wave-equation via characteristics
  - (b) Analysis of the vibrating string problem via characteristics

Additional Criteria:

- (a) Nonlinear problems (shallow water/ Burger's equation)
3. Optional Topics
    - (a) Other topics at the discretion of the instructor, for example - Finite Element Method, Spectral Method, Stochastic PDEs, Weak Solutions etc.
  4. In depth presentation of an application of PDEs.
    - (a) A written report.
    - (b) An oral presentation.