Learning Outcomes

Mathematical models of problems in science and engineering often take the form of partial differential equations. These equations can be of first order, second order, or even higher order, and can be linear or nonlinear. Analytical methods leading to exact solutions are mostly limited to linear equations, and these exact solutions are often written in terms of a sum (infinite series or integral) of fundamental solutions. The focus of the course will be on developing the theory and application of certain mathematical methods for the exact solution of partial differential equations, mostly linear, that arise in applications of science and engineering. Successful completion of the course should enable you to

1. demonstrate an understanding of
   - mathematical modeling leading to the formulation of suitable partial differential equations.
   - solution techniques, including separation of variables, eigenfunction expansions, characteristics, among others.

2. obtain exact solutions for a range of partial differential equations and interpret the solutions in terms of the mathematical model.

3. present written solutions to problems in a clear, concise, and coherent fashion.

This knowledge is essential for the theoretical understanding of a wide range of mathematical models based on partial differential equations.