

(3 credits)

001-2-4019

Lectures	Exercise	Laboratory	Field Trip
3			

The course includes:

· **Basic Concepts**

Symmetries and groups of transformations. One-parameter groups of point transformations and their infinitesimal generators. Invariants of a transformation group. Canonical coordinates. Extended group transformations (Prolongations) and their generators. Multi-parameter Lie groups of transformations.

· **Point Symmetries of Differential Equations**

Invariance of differential equations under a one-parameter Lie group of transformations. Infinitesimal criterion for invariance of a differential equation or a system of equations. An algorithm to determine the infinitesimal generators of a symmetry group (Determining Equations). Using symbolic software for the computation of Lie symmetries of differential equations.

· **Applications of Point Symmetry Groups to the Study of Partial Differential Equations (PDEs)**

Generating solutions by symmetry group transformations. Invariant (similarity) solutions and symmetry (similarity) reductions of a scalar PDE. Solutions invariant under multi-parameter symmetry group; multiple reduction of variables. Invariant solutions of a system of PDEs. Applications to boundary value problems.

· **Some Other Methods Designed for Finding Similarity Solutions of PDEs**

Conditional symmetries and the "nonclassical methods". Direct reduction methods. Weak symmetries.

· **Symmetries More General than Lie Point Symmetries**

Contact transformations and contact symmetries. Lie-Backlund transformations and Lie-Backlund symmetries Potential (nonlocal) symmetries.

Lecturer: G.I.Burde

Recommended Reading:

Bluman, G.W. and S. Kumei. (1989). *Symmetries and Differential Equations*. Springer, New York.

trackfull degree