25MA804 Applications of Lie Group of Transformations to Differential Equations   4 0 0 4

Course Outcome:

CO1: Understand the concept of the Lie Group Transformations and their properties. Also, understand the fundamental idea of one or more parameters of the Lie Group Transformations.
CO2: Understand the Concepts of Lie algebras and classifications of sub-algebras.
CO3: Study the applications of the Lie group transformations to ordinary differential equations.
CO4: Study the applications of the Lie group transformations to partial differential equations.

Unit-1

Introduction - Lie groups – elementary examples, Lie groups of transformations, Infinitesimal transformations, First Fundamental Theorem of Lie – Canonical coordinates, Extended group transformations and infinitesimal transformations (one independent and one dependent variables), Multi-parameter Lie groups of transformations second and third fundamental Lie's theorem.

Unit-2

Lie Algebras - elementary examples - classification of sub algebras and their applications, Invariance of first and second order ordinary differential equations, Applications of Lie groups of transformations to ordinary differential equations.

Unit-3

Introduction - Review of first and second order partial differential equations with two independent variables, Extended group transformations and infinitesimal transformations with two independent and one dependent variables.

Unit-4

Invariance of a partial differential equations of second order **-** Heat equation, one dimensional wave equation, nonlinear Heat equations **-** Reduction of independent variables **-** similarity solutions.

Unit-5

Applications of Lie groups of transformations: Kortedweg de Vries equation and nonlinear Heat equations.

References:
 1. G.W. Bluman and S. Anco, Symmetry and Integration for Differential Equations,

Springer, Berlin, 2002.

2. P.J. Olver, Applications of Lie groups to Differential equations, Springer, Berlin, 1998.

3. Peter E. Hydon, Symmetry Methods for Differential Equations: A Beginner's Guide, Cambridge University Press, Cambridge, 2000.

4. Daniel J. Arrigo, Symmetry Analysis of Differential Equations: An Introduction, Wiley, New Jersey, 2015.

Evaluation Pattern:

External-50 Marks
End semester Examination: 50 Marks

Internal-50 Marks
Continuous Assessment: 20 Marks
Midterm Examination: 30 Marks