MA704 Dynamical System

Credit: 3-0-0-3 Approval: Approved in 2nd Senate

Prerequisites: Knowledge of Functional Analysis, Ordinary and Partial Differential Equations, Linear Algebra
Students intended for: Ph.D.

Elective or Core: Elective Semester: Odd

Course objective:

It is an advanced course in mathematics designed to provide a clear understanding of the qualitative theory of ordinary differential equations and the concepts of dynamical systems. A major part of the course is devoted to the qualitative or geometrical theory of nonlinear systems.

Course content:

- **Linear Systems**: Diagonalization, Exponentials of Operators, Fundamental theorem for linear systems, Jordan Forms, Stability Theory, Nonhomogeneous linear systems [10 hours]
- **Local Theory of Nonlinear Systems**: Existence Uniqueness Theorem, Maximal Interval of Existence, Flow, Stable Manifold Theorem, Hartman-Grobman Theorem, Lyapunov Functions, Nonhyperbolic Fixed Points, Centre Manifold Theorem, Normal Form Theory, Gradient and Hamiltonian Systems [15 hours]
- **Global Theory of Nonlinear Systems**: Global Existence Theorem, Periodic Orbits, Limit Cycles and Separatrix cycles, Poincare Map, Stable Manifold Theorem for Periodic Orbits, Poincare-Bendixson theory, Lienard Systems, Bendixson's criteria, Poincare Sphere and Behaviour at Infinity, Global Phase Potraits and Separatrix Configurations, Index Theory [15 hours]

Text Book

Qualitative Theory of Second Order Dynamical Systems, A.A. Andronov, E.A. Leontovich, I.I. Gordon, and A.G.Maier, John Wiley, New York.

V.V. NemytskiiandV.V.Stepanov, Qualitative Theory of Differential Equations, Princeton University Press, Princeton.

Reference Books

Differential Equations: Geometric Theory, S.Lefschetz ,Interscience, , New York.

Geometric Theory of Dynamical Systems, J.Palais and W. De Melo, Springer Verlag, New York

Other Faculty Members interested in teaching this course: Not known

Proposed by: Dr. NituKumari School: Basic Sciences