MA 404: Ordinary Differential Equations (3-1-0:4)

Review of solution methods for first order as well as second order equations, Power Series methods with properties of Bessel functions and Legendré polynomials.

Existence and uniqueness of Initial Value Problems: Picard's and Peano's theorems, Gronwall's inequality, continuation ofsolutions and maximal interval of existence, continuous dependence.

Higher order linear equations and linear Systems: fundamental solutions, Wronskian, variation of constants, matrix exponential solution, behaviour of solutions.

Two dimensional autonomous systems and phase space analysis: critical points, proper and improper nodes, spiral points and saddle points. Asymptotic behavior: stability (linearized stability and Lyapunov methods).

Boundary Value Problems for second order equations: Green's function, Sturm comparison theorems and oscillations,eigenvalue problems.

Text Books and References

1. S. L. Ross, “Differential Equations”, Wiley India.
2. L. Perko, “Differential Equations and Dynamical Systems”, Springer Verlag, New York.
3. W. Walter, “Ordinary Differential Equations”, Springer.
4. E. A. Coddington and N. Levinson, “Theory of Ordinary Differential Equations”, McGraw Hill.