

Department of Mathematics
Faculty of Mathematics & Computer Science
M.Sc. (Applied Mathematics), 1st Semester

Course Code	AM103
Course Name	Ordinary Differential Equations
Course Credits	04

Course objective:

To be able to solve variety of ordinary differential equations, understand the theory underlying the solution techniques, conversant with methods of applying differential equations in various physical phenomenon and application of Maple programming in ordinary differential equations.

Minimum pre-requisites:

Course structure:

Review of solution methods for first order and second order ordinary differential equations, Power series methods with properties of Bessel functions and Legendré polynomials.

Applications of Integral transformations to ordinary differential equations.

Existence and Uniqueness of Initial Value Problems: Picard's and Peano's Theorems, Gronwall's inequality, continuation of solutions and maximal interval of existence, continuous dependence.

Higher Order Linear Equations and linear Systems: fundamental solutions, Wronskian, variation of constants, matrix exponential solution, behavior of solutions.

Two Dimensional Autonomous Systems and Phase Space Analysis: critical points, proper and improper nodes, spiral points and saddle points. Asymptotic Behavior: stability, Lyapunov methods.

Boundary Value Problems for Second Order Equations: Green's function, Sturm comparison theorems and oscillations, eigenvalue problems.

Reading suggestions:

- M. Hirsch, S. Smale and R. Devaney, *Differential Equations, Dynamical Systems and Introduction to Chaos*, Academic Press, 2004.

- L. Perko, *Differential Equations and Dynamical Systems, Texts in Applied Mathematics, Vol. 7, 2nd Edition*, Springer Verlag, New York, 1998.
- E. A. Coddington, N. Levinson, *Theory of ordinary differential equations*, McGraw Hill, 2002.
- R.P. Agarwal and D O'Regan, *An Introduction to ordinary differential equations*, Springer-Verlag, New York, 2008.
- TynMyint U., *Ordinary differential equations*, Elsevier North-Holland, 1978

Evaluation and weightage:

- Mid-semester examination (40)
- End-semester examination (40)
- Quiz/Assignments (20)