

Bachelors with Mathematics as Major

6th Semester

MMT622J2: Mathematics/Applied Mathematics: Differential Equations

Credits: 4 THEORY + 2 TUTORIAL

Theory: 60 Hours & Tutorial: 30 Hours

Course Objectives: (i) To familiarize the students with various methods of solving differential equations and to have a qualitative applications through models.

Expected Outcomes: After completion of this course the students shall be able to handle various real life problems and their dynamical processes.

Theory: 4 Credits

Unit- I

First order, higher degree differential equations: Solvable for x, y and p, methods for solving higher-order differential equations, basic theory of linear differential equations, Clairaut's form of differential equations, linear homogenous and non-homogeneous differential equations with constant coefficients. The method of variation of parameters.

Unit-II

Singular solution: double points, p-discriminant, c-discriminant, complete primitive, node, cusp and tac-locus, envelope. Solution in series: trial solution, indicial equation, solution of second and higher order differential equations based on the behavior of the roots of the indicial equation.

Unit-III

Simultaneous differential equations $dx/P = dy/Q = dz/R$, Total differential equations $Pdx + Qdy + Rdz = 0$, Geometrical interpretations of simultaneous and total differential equations. System of homogeneous and non-homogeneous differential equations, Solution matrix of homogeneous differential equations and fundamental set of solutions, Wronskian and its properties.

Unit-IV

Origin of partial differential equations-PDE, formation of PDE by elimination of arbitrary constant and arbitrary functions, linear partial differential equations, complete, general and singular solution of PDE, Lagrange's and Charpit's methods for the solution of linear and non-linear PDE's.

Tutorials: 2 Credits.

Unit- V

Problems based on homogeneous and non-homogeneous differential equations, simultaneous and total differential equations, linear dependence and independence of solutions using Wronskian.

Unit – VI

Problems based on singular solutions, simultaneous system of equations, total differential equations. Problems on solution of PDE's using Lagrange's and Charpit's methods.

Books Recommended:

1. Zafar Ahsan, Differential Equations and their Applications, PHI, Pvt. Ltd. New Delhi-Second edition, 2004
2. HTH Piaggio, Differential Equations, CBS Publishers and Distributors, New Delhi, 2004.
3. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
4. C.H. Edwards and D.E. Penny, Differential Equations and Boundary Value problems Computing and Modeling, Pearson Education India, 2005.
5. K.S. Rao, Introduction to Partial Differential Equations, PHI, New Delhi, Pvt Ltd, 2011.