

Semester-2

Core Paper 4: Differential Equations-I and Group Theory-I

Paper Code: HMTCR2041T, Full Marks: 100 (78 Classes), Total Credit:6=5+1(Th+Tutorial),

Module-I: Differential Equations-I (39 Classes)

Course Objective: To familiarize with the various methods of solving second order, higher order linear ODE and system of ODE with two variables and some simple applications.

General solution of linear homogeneous differential equation of second and higher order, principle of superposition .Wronskian: its properties and applications. Linear inhomogeneous equations of higher order with constant coefficients,Cauchy-Euler's equation, Method of undetermined coefficients. Second order differential equations with variable coefficients—finding complementary function in terms of a known integral. Method of variation of parameters to solve inhomogeneous equations.

Exact higher order ode.

System of linear differential equations in two unknowns.Reduction of higher order linear differential equations into a system of first order linear differential equations. Differential operators, solving a system of linear odes by operator method as well as eigen value method.

Second order ode with variable coefficients: Power series solution at an ordinary point and Frobenius series solution at a regular singular point.

Study of models on second order ode: SHM [different case study in details]

References:

- (1) S.L. Ross: Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
- (2) G.F.Simmons: Differential Equations with Historical Notes.
- (3) TynMyint-U and LokenathDebnath, Linear Partial Differential Equations for Scientists and Engineers, 4th edition, Springer, Indian reprint, 2006.
- (4) Martha L Abell, James P Braselton, Differential Equations with MATHEMATICA, 3rd Ed., Elsevier Academic Press, 2004.
- (5) Walter Kelley & Allan Peterson ,Difference equations: An Introduction with Applications , (Academic press,1991)
- (6) R. Kent Nagle, Edward B. Saff, Arthur David Snider --Fundamentals of Differential Equations (8 th Ed.),Pearson
- (7) R. Kent Nagle, Edward B. Saff, Arthur David Snider --Fundamentals of Differential Equations (8 th Ed.),Pearson
- (8) Differential Equations – D.A.Murray [Orient Longmann]

Module-II: Group Theory -I (39 Classes)

Course Objective: Learning and application of concept of internal binary operation and algebraic systems in particular, with group, various examples of cyclic groups, permutations groups, Lagrange's Theorem relating order of a subgroup of a finite group to that of the group.

Recapitulations of Sets and their Cartesian product ,Relations, Equivalence Relations and Partitions , Mappings (5). Binary

operation, Algebraic system with special reference to field as an example of an algebraic system. Definition, examples, properties of groups (10) , groups of n th roots of unity, permutation groups, group of residue modulo

classes(8), properties relating to order of an element of a group, order of a group (3), Subgroups(3), Cyclic groups, group of units modulo n , Fermat's Little theorem, Euler's theorem (5), Cosets(2), Lagrange's Theorem for finite groups and its consequences(3).

References:

- (1) First Course in Abstract Algebra— J. B. Fraleigh
- (2) Abstract Algebra—D.S. Dummit and R. M. Foote
- (3) Algebra—M. Artin
- (4) Topics in Algebra—I. N. Herstein
- (5) Topics in Abstract Algebra—M. K. Sen, S. Ghosh, P. Mukhopadhyay