Code:MSM511 Real Analysis

Real number system and its order completeness, sequences and series of real numbers. Metric spaces: Basic concepts, continuous functions, Intermediate Value Theorem, Com

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

Compactness, Heine-Borel Theorem.

Differentiation, Taylor's theorem, Riemann Integral, Improper integrals Sequences and series of functions, Uniform convergence, power series, Fourier series, Weierstrass approx imation theorem, equicontinuity, Arzela-Ascoli theorem.

References

1. W. Rudin, Principles of Mathematical Analysis, McGraw-hill, 1976. 2. C.C. Pugh, Real Mathematical Analysis, Springer, 2002.
3. T. M. Apostol, Mathematical Analysis, 2nd Edition, Narosa, 2002. 4. G. F. Simmons, Introduction to Topology and modern Analysis, International Stu dent edition, 1963.

Code:MSM512 Linear Algebra

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

Vector Spaces:, subspaces, bases and dimensions, co-ordinates, summary of row equiva lence.

Linear Transformations: Linear transformation, the algebra of linear transformation, Isomorphisms, representation of transformations by matrices.

Linear Transformations (contd) : Linear functionals, the double dual, the transpose of linear transformations

Determinants: Commutative Rings, Determinant functions, Permutation and the unique ness of determinants, Additional properties of determinants Elementary Canonical Forms: Introduction, characteristic values, annihilating polynomials,

invariant subspaces, simultaneous triangulation, simultaneous diagonalisation, direct sum decomposition, in variant direct sums, Jordan form and diagonalization.

References

1. Kenneth Hoffman and Ray Kunze, Linear Algebra, Second edition, Prentice Hall of India Private Ltd, New Delhi, 1971.
2. Klaus Janich, Linear Algebra, Springer Verlag, 1994.
3. Paul R. Halmos, Linear Algebra Problem Book, The Mathematical Association of America, 1995.

Code:MSM513 Discrete Mathematics

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4

Set theoretic operations and functions - Countable and uncountable sets - Mathemat ical induction - Binary relations - Pigeonhole principle - Recurrence- Discrete numeric functions Generating functions recurrence relations.

Lattices as algebraic systems - Principles of duality - Basic properties - Distributive and complemented lattices - Boolean lattices - Boolean algebra - Boolean functions and expressions.

Introduction to Graphs : The concept of a graph, Paths in graphs, Graphs and graph models, Graph terminology and special types of graphs, Bipartite graphs, Complete graphs, External graphs, Intersection graphs, Graph Isomorphism. Blocks, Cutpoints, bridges and blocks. Block graphs and cutpoint graphs. Trees - Properties of trees - Distance and centers- BFS Algorithm.

4

Eulerian Graphs, Hamiltonian Graphs. Coverings and Matching : Coverings and inde pendence, Critical points and lines, Matching, Maximum Matching Problem, Minimum covering problems. Representing Graphs : Adjacency matrix, Incidence matrix, Cycle matrix. Planarity : Plane and planar graphs, Outerplanar graphs, Kuratowski's theorem - coloring problems - basic ideas.

References

1. C.L.Liu, Elements of Discrete Mathematics, TMH ,2000.
2. J.P. Trembly& R. Manohar, Discrete mathematical structures with applications to Computer Science,

McGraw Hill.
3. Frank Harary, Graph Theory,Addison - Wesley series in mathematics, Perseus Books, 1994.
4. Norman L. Biggs, Discrete Mathematics, Oxford University Press, 2002.

Code:MSM514 Algebra - I

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
and Computational number theory: Permutations and combinations, Fermats little the orem, Wilsons theorem, Generating functions; Fundamentals of congruences - Residue systems, Riffling; Solving congruences - Linear congruences, Chinese remainder theorem, Polynomial congruences.

Plane Isometries , Direct products & finitely generated Abelian Groups, Binary Linear Codes, Factor Groups, Factor-Group Computations and Simple Groups, Series of groups. Group action on a set, Applications of G-set to counting, Isomorphism theorems: Proof of the Jordan-Holder Theorem , Sylow theorems, Applications of the Sylow theory, Free Groups , Group

Basic representation theorem, The fundamental theorem of arithmetic; Combinatorial Presentations.

References

1. George E.Andrews: Number Theory, Dover Publications, New York, 1971. 2. Tom M. Apostol, Introduction to Analytic Number Theory, Springer, 1998. 3. Joseph Gallian, Contemporary Abstract Algebra, 7th Edition, Cengage Learning, 2009.

4. M. Artin: Algebra, Prentice Hall, 1991.
5. Thomas W. Hungerford, Algebra ,Springer, 2003.
6. John B. Fraleigh, A First Course in Abstract Algebra, 7th Edition, 2002.

Code:MSM515 Ordinary Differential Equations Ordinary Differential Equations: Linear Equations with constant

coefficients - Second

Lectures : 3 Tutorials : 2 Practical : 0 Credits : 4
order Homogeneous equations - Initial value problems - Linear dependence and indepen dence Wronskian and a formula for Wronskian - Non Homogeneous equation of order two.
Homogeneous and Non - Homogeneous Equations of order 'n' - Initial value problems - annihilator Method to solve a non - homogeneous equation - Algebra of constant coeffi cients operators.

5

Linear Equations with variable coefficients - Initial value problems - Existence and Uniqueness Theorems - Solutions to a non - homogeneous equation - Wronskian and Linear dependence - reduction of the order of a homogeneous equation - Homogeneous equation with analytic coefficients - The Legendre equation.
Linear Equation with regular singular points - Euler Equation - Second order equations with regular singular points - Exceptional cases - Bessel equation.
Existence and Uniqueness of solutions to first order equations - Equation with variables separated - Exact Equations - Method of successive approximations - The Lipschitz condition - convergence of the successive approximations and the existence theorem.

First order systems in two variables and linearization: The general phase plane-some population models - Linear approximation at equilibrium points - Linear systems in matrix form.
Averaging Methods: An energy balance method for limit cycles - Amplitude and fre quency estimates - slowly varying amplitudes - nearly periodic solutions - periodic solu tions: harmony balance - Equivalent linear equation by harmonic balance - Accuracy of a period