Shivaji University, Kolhapur
M.A./ M.Sc. Part-II (Regular & Distance Mode ) To be Implanted from Academic Year – 2010 -2011

STRUCTURE OF M.A./ M.Sc. MATHEMATICS SEM.-III & IV

SEMESTER – III
Compulsory Papers
NMT :- 301 Functional Analysis
NMT :- 302 Advanced Discrete Mathematics
Any three from the following (Optional Papers )
NMT:- 303 Operation Research –I
NMT:- 304 Riemannian Geometry – I
NMT:- 305 Fluid Mechanics-I
NMT:- 306 Fuzzy Mathematics –I
NMT:- 307 Graph Theory
NMT:- 308 Number Theory
NMT:- 309 Algebraic Topology
NMT:- 310 Numerical Solutions of Partial Differential Equations

SEMESTER – IV
Compulsory Papers
NMT:- 401 Measure and Integration
NMT:- 402 Partial Differential Equations
Any three from the following (Optional Papers )
NMT:- 403 Operation Research –II
NMT:- 404 Riemannian Geometry – II
NMT:- 405 Fluid Mechanics-II
NMT:- 406 Combinetorics
NMT:- 407 Automata Theory
NMT:- 408 Algebraic Number Theory
NMT:- 409 Artificial Neural Networks and Genetic Algorithms
NMT :- 410 Integral Equations
(i) Paper – NMT - 301

(ii) Title Of Paper: Functional Analysis

(iii) Specific Objectives:
The course aims at familiarizing students with the basic concepts, principles and methods of functional analysis and its applications. Functional analysis plays an important role in the applied sciences as well as in mathematics itself. Functional analysis develops the tools from calculus and linear algebra further to the more general setting where one has vector spaces comprising functions or general abstract infinite-dimensional vector spaces. Most of the problems from various application areas can be solved using the techniques of functional analysis. The basic objects studied in functional analysis are normed linear spaces and continuous maps between such spaces. This interplay between the algebraic and analytic setting gives rise to many interesting and useful results, which have a wide range of applicability to diverse mathematical problems

(iv) A brief note :-
Theorems and proofs are expected to be prepared from Topology and Modern Analysis by G.F.Simmons. This should be taken into account for examination point of view.

(v) UNIT | No. of Lectures
--- | ---
Unit I : | 15
Normed linear spaces, Banach spaces, Quotient spaces, continuous linear transformations, equivalent norms, the Hahn-Banach theorem and its consequences. Conjugate space and separability, second conjugate space. The natural embedding
of the normed linear space in its second conjugate space, Weak *topology on the conjugate space.

Unit II


Unit III

Orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Parseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of an operator,

Unit IV

self adjoint operators, Normal and unitary operators, Projections, Eigen values and eigenvectors of on operator on a Hilbert space, The determinants and spectrum of an operator, The spectral theorem on a finite dimensional Hilbert space.

(vi) Recommended Books :


(vii) Reference Books

3. B.V.Limaye : Functioned Analysis, New age international.
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics ( Part II Sem III)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 302

(ii) Title Of Paper: Advanced Discrete Mathematics

(iii) Specific Objectives:
Computer science uses an area of Mathematics as ‘Discrete Mathematics’. The purpose of this course is to provide basic topics of Discrete Mathematics such as Graph Theory, Counting techniques and Boolean Algebra.

(iv) A brief note:–
Theorems and proofs are expected to be prepared from recommended books. This should be taken in to account for examination point of view.

(v) UNIT No. of Lectures
Unit – I (15)
Graph Theory: Definition, examples and properties, Simple graph, Graph isomorphism, Bipartite graphs, Complete Bipartite graph, regular graph, sub-graphs spanning sub-graph, Edge deleted sub-graph, Vertex deleted sub-graph, Union and intersection of two graphs, complements of a graph, self complementary graph, paths and cycles in a graph, Eccentricity, radius and diameter of a connected graph, Peterson graph, Wheel graph. Isomorphism of Graphs. First theorem of graph theory.

Unit – II (15)
The Matrix representation of a graph, Adjacency matrix and Incidence matrix of a graph, Definition and simple properties of a tree, bridges, spanning trees, Inclusion exclusion principle. Simple examples on Inclusion exclusion principle Pigeonhole principle, examples on Pigeonhole principle.
Unit – III

Discrete numeric functions and sum and product of two numeric functions, generating functions, Linear recurrence relations with constant coefficients Particular solutions of linear recurrence relations, Total solutions.

Unit – IV

1) Ordered sets and lattices Hasse diagrams of P.O.D. sets
2) Supremum and infimum
3) Isomorphic ordered sets, well-ordered sets
4) Lattices, Bounded lattices
5) Distributive lattices, Complements complemented lattices
6) Boolean algebra, Basic definitions, Basic theorems, duality, Boolean algebras as lattices

(vi) Recommended Reading:

3. C. T. Liu: Discrete Mathematics

(vii) Reference Books

1. Gorrett Birkhoff: Lattice Theory
2. Rich and Brualdi: Combinatorics
3. John C. Martin: Introduction to languages and the theory of computation
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem III)
(Introduced from June 2010 onwards)
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(i) Paper – NMT - 303

(ii) Title Of Paper: Operation Research – I

(iii) Specific Objectives:

The main purpose of this course is to provide the students with basic concepts of Operation Research and specific methods of solving O.R. problems.

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I 15 lectures

Unit- II 15 lectures
Revised simplex method in standard form I, Duality in linear programming duality theorems, Integer linear programming, Gomory’s cutting plane method, Branch and Bound method.
Unit – III  
15 lectures
Dynamic programming. Bellman's principle of Optimality, solution of problems with a finite number of stages. Application of dynamic programming in production, inventory control and linear programming.

Unit – IV  
15 lectures
Non linear programming unconstrained problems of maximum and minimum Lagrangian method Kuhn Tucker necessary and sufficient conditions, Wolfe’s method, Beale’s method

(vi) Recommended Reading:

1) S.D.Sharma : Operations Research, Kedar Nath Ram Noth and co.

(vii) Reference Books

4. S.D.Sharma :Nonlinear and Dynamic programming Kedar Nath Ram Nath and Co. Meerut
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics ( Part II Sem III)
(Introduced from June 2010 onwards)
( Regular and external )

(i) Paper – NMT - 304

(ii) Title Of Paper: Riemannian Geometry -I

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit I: (15 lectures)

Space of N-dimensions, hypersurface, transformation of co-ordinates, summation
convention, contravariant vectors, scalar invariants, covariant vectors, scalar product
of two vectors, symmetric and skew symmetric tensors, contraction, composition of
tensors, Quotient law, reciprocal symmetric tensor of the second rank, Quadratic
forms, real quadratic forms, Quadratic differential forms.

Unit II: (15 lectures)

Riemannian metric, Riemannian space, length of a curve, magnitude of a vector,
inclination of two vectors, orthogonal vectors, co-ordinate hypersurfaces, co-ordinate
curves, field of normals to the hypersurface, n-ply orthogonal system of
hypersurfaces, congruences of curves, orthogonal enuples, Principal directions for a
symmetric covariant tensor of the second rank, Euclidean space of n- dimensions.
Unit III: (15 lectures)
Three index symbols, second derivatives of the $x'$s with respect to $x'$s, covariant derivative of a covariant and contravariant vectors, curl of a vector, derived vector in a given direction, covariant differentiation of tensors, divergence of a vector, Laplacian of a scalar invariants.

Unit IV: (15 lectures)
Curvature of a curve, Principal normal, Euler’s conditions, Differential equations of geodesic, Geodesic co-ordinates, Riemannian co-ordinates, Geodesic form of the linear element. Parallel displacement of a vector of constant magnitude, parallelism for a vector of variable magnitude, subspaces of a Riemannian manifold, parallelism in a subspace. Tendency and divergence of vectors with respect to subspaces or enveloping space.

(vi) Recommended Reading:


(vii) Reference Books

1. J.A. Schouten: Ricci Calculus, Springer Verlag, Berlin
3. Differential Geometry, O’ Neil
4. Differential Geometry, Nirmal Prakash
(i) Paper – NMT - 305

(ii) Title Of Paper: Fluid Mechanics I

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) Content of the syllabus:

Unit – I 15 lectures

Introduction to continuum motion, fluid particle, inertial co-ordinates frames, continuum hypothesis, time derivatives, velocity and acceleration, steady and non-steady flow, stream line, path line, streak line, stream function, kinematics of vorticity and circulation, vortex line, vortex tube.

Unit-II 15 lectures

Eulerian and Lagrangian method of description of fluids, Equation of continuity in Euler’s form, equation of continuity in Euler’s form, equation of continuity in Lagrange’s form, equivalence of two forms of the equation of continuity, equation of continuity in curvilinear, spherical polar, cylindrical co-ordinates, Translation, rotation and deformation of fluid element, General motion of fluid element, boundary surface.

Unit-III 15 lectures

Shear rate, strain rate tensor, principal co-ordinate systems, principal rate of extension, principal shear rates, strain rate tensor in different co-ordinate systems, stress tensor, normal stress, shearing stresses, symmetry of stress tensor, principal axes and principal values of stress tensor.
Unit- IV

15 lectures

Conservation laws, equation of conservation of mass, equation of conservation of momentum, equation of moment of momentum, Bernoulli’s equation, Bernoulli’s equation for irrotational motion. General Theorems: Flow and circulation, irrotational motion, Kelvin’s circulation theorem, Helmholtz’s vorticity equation, Kelvin’s minimum energy theorem

(vi) Recommended Books:

2) Bansi Lal, Hydrodynamics

(vii) References Books:-

REvised Syllabus for
M.A./M. Sc. Mathematics (Part II Sem III)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 306

(ii) Title Of Paper: Fuzzy Mathematics - I

(iii) Specific Objectives:
To introduce the theory of fuzzy sets as a measure of uncertainty and ambiguity.
Also to introduce the different operations on fuzzy sets.

(iv) A brief note :-
Theorems and proofs are expected to be prepared from Fuzzy sets and Fuzzy logic.
Theory and applications, by Klir George and Bo Yuan, Prentice Hall of India Pvt. Ltd.
New Delhi. 1997. This should be taken in to account for examination point of view

(v) UNIT No. of Lectures

Unit I (15 lectures)
1. The notion of fuzzy sets
2. Convex fuzzy set.
3. Basic concepts in fuzzy sets.
4. Properties of level cuts.

Unit II (15 lectures)
1. Representation of Fuzzy sets, Decomposition theorems.
2. Extension principle for fuzzy sets.
3. Operations on fuzzy sets, fuzzy complements.

Unit III (15 lectures)
1. Increasing and decreasing generators and their pseudo-inverses
2. Fuzzy union: t – co norms
3. Combinations of operations
4. Aggregation of operations

**Unit IV**  
(15 lectures)

1. Fuzzy numbers their characterizations.
2. Arithmetic operations on intervals of real numbers.
3. Arithmetic operations on fuzzy numbers
4. Lattice of fuzzy numbers

**(vi) Recommended Books :**


**(vii) Reference Books**

2) Lowen R., Fuzzy set theory, 1996
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem III)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 307
(ii) Title Of Paper: Graph Theory
(iii) Specific Objectives:
(iv) A brief note :- ()
(v) UNIT No. of Lectures
Unit – I (15)
Trees and connectivity: Definitions and simple properties, Bridges, spanning trees, cut vertices and connectivity. Euler Tours
Unit – II (15)
Euler Tours and Homiltonian Cycles: Eulertours, the chinese postman problem, Hamiltonion graphs. The travelling salesman problem. Matchings : Matchings and Augmenting paths
Unit – III (15)
Unit – IV (15)

(vi) Recommended Reading:

(vii) Reference Books
1) Douglas B. West : Introduction to Graph Theory Pearson Education .Asia.
2) F. Harary - Graph Theory, Narosa Publishing House (1989)
3) K.R.Parthsorthy : Basic Graph Theory, Tata McGraw Hill publishing Co.Ltd. New Delhi
(i) Paper – NMT - 308

(ii) Title Of Paper: Number Theory

(iii) Specific Objectives:

To introduce the students to the fascinating world of numbers. This course does not require very sophisticated tools of mathematics. There are so many open problems such as Goldbach Conjecture. Infact there are plenty of properties of integers which are yet to be explore.

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit I: (15 lectures)
Review of divisibility : The division algorithm, G.C.D., Euclidean algorithm
Diophontine equation ax + by = C.Primes and their distribution : Fundamental theorem of Arithmetic, The Goldbach Conjecture

Unit II: (15 lectures)
Unit III:                      (15 lectures)
Euler's Generalization of Fermat's theorem: Euler's phi function, Euler's theorem, properties of phi function, An application to Cryptography. Primitive roots: The order of an integer modulo n

Unit IV:                      (15 lectures)
Primitive roots for primes, composite numbers having primitive roots, The theory of Indices. The Quadratic reciprocity law: Eulerian criteria, the Legendre symbol and its properties, quadratic reciprocity, quadratic reciprocity with composite moduli

(vi) Recommended Reading:


(vii) Reference Books

REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem III)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 309
(ii) Title Of Paper: Algebraic Topology
(iii) Specific Objectives:
(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I (15)
Geometric complexes and polyhedra: Orientation of Geometric Complexes, incidence number, Problems. Simplicial homology groups: Chains, cycles

Unit – II (15)
Boundaries of homology groups, Examples of homology groups, The structure of homology groups, The Euler Poincare theorem, Problems. Euler's theorem, Pseudomanifolds and Homology groups of Sn. Simplicial Approximation: The simplicial mapping and its properties

Unit – III (15)
The simplicial Approximation theorem, Induced homomorphisms on the homology groups, Brouwer's degree theorem, Problems. The Brouwer fixed point theorem and related topics, The Brower fixed point theorem, The Brouwer- Poincare theorem

Unit – IV (15)
The fundamental Groups: Homotopic paths and fundamental groups, Problems. The covering Homotopy property for S1, The covering path property, The relation between H(K) and _1 (|k|) Covering spaces: Basic properties of covering spaces, Problems.

(vi) Recommended Books:


(vii) References Books:-

2) W.S.Massey : Algebraic Topology an introduction, Harcourt Broce and World Inc. N.Y.,
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics ( Part II Sem III)
(Introduced from June 2010 onwards)
( Regular and external )

(i) Paper – NMT - 310

(ii) Title Of Paper: Numerical solutions of Partial Differential Equations

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I (15)
Classification of First order and second order partial differential equations. Finite difference approximations of partial derivatives, order of approximations of first derivatives and second derivatives.

Unit – II (15)

Unit – III , (15)
Convergence and stability Descriptive treatment of convergence, local transaction error and consistency, descriptive treatment of stability, Analytical treatment of convergence, analytical treatment of stability.
Error Analysis, global rounding error, local truncation error, consistency or compatibility, relationship between convergence, stability and consistency, Lax’s equivalence theorem.

Hyperbolic equation and characteristics, first order quasilinear equations, method of numerical integration along a characteristic, rectangular nets and finite difference methods for second order hyperbolic equation. Explicit methods and CFL condition finite difference representations for Laplace’s equation.

(vi) Recommended Books:


(vii) References Books:-


(i) Paper – NMT - 401
(ii) Title Of Paper: Measure and Integration
(iii) Specific Objectives:
1) To study the fundamentals of abstract measure on any space $X$ and to define integration on this space $X$
2) To study the signed measure as a generalization of measure.
3) To introduced a measure on product space and to define integration on product space.
4) To study the $L^p$ – spaces on general measure spaces.
5) To study outer measure and inner measure and their properties.

(iv) A brief note :-
Theorems and proofs are expected to be prepared from Real Analysis by H. L. Roydon. This should be taken in to account for examination point of view.

(v) UNIT         No. of Lectures
Unit – I          (15)
(1) Measure spaces : Finite, $\sigma$- finite and semifinite measures. Complete measure spaces, Locally measurable sets, Saturated measures.
(2) Measurable functions and their properties.
(3) Integration : Integration of nonnegative extended real valued functions, Fatou’s lemma,
(4) Monotone convergence theorem, Lebesgue convergence theorem.
Unit – II          (15)
(1) Signed measure : Positive sets, Negative sets and their properties.
(2) Hahn decomposition theorem, Jordan decomposition theorem, Total variation of a signed measure.
(3) The Radon –Nikodym theorem, Radon-Nikodym derivative.
(4) Lebesgue decomposition theorem.

Unit – III ,

(1) Product Measure : Measurable rectangles, Cross sections and their measurability.
(2) Fubini's theorem, Tonelli’s theorem.
(3) The $L^p$ spaces.
(4) Riesz representation theorem.

Unit – IV

(1) Outer measure and measurability , Complete measure as a restriction of an outer measure on a class of measurable sets.
(2) Measure on an algebra. Induced outer measure and its properties.
(3) Inner measure generated by measure on algebra.
(4) Properties of inner measure.

(vi) Recommended Books:


(vii) References Books:-

(3) Halmos, P. K. Measure Theory. Van Nostrand. (1950)
(6) Zygmud, A. Measure and Integration. Marcel Dekker (1977)..
(i) Paper – NMT - 402

(ii) Title Of Paper: : Partial Differential Equations

(iii) Specific Objectives:

To introduce to the students the main topics of partial differential equations, theory, basic methods and their applications to related areas.

(iv) A brief note :- ()

Theorems and proofs are expected to be prepared from T.A. Amaranath, An elementary course in partial differential equation. This should be taken into account from examination point of view.

(v) UNIT No. of Lectures

Unit – I (15)

First order partial differential equations, curves and surfaces. Classification of integrals, linear equations of first order, Pfafficum differential equations, compatible systems.

Unit – II (15)

Charpit’s method, Jacobi’s method Integral surface through a given curve, second order partial differential equations, classification of second order partial differential equations.
Unit – III


Unit – IV

Heat conduction equation.
Heat conduction – infinite rod case
Heat conduction – Finite rod case by method of separation of variables, Uniqueness of the solution,
Families of Equipotential surfaces, Kelvin’s Inversion Theorem

(vi) Recommended Books:


(vii) References Books:-

1) Fritz John, Partial Differential Equations
2) R. McOwen ,Partial Differential Equations Pearson Education
(i) Paper – NMT - 403

(ii) Title of Paper: Operation Research II

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I (15)
Replacement Problems, Failure mechanism of items, Replacement policy for items whose maintenance cost increases with time and money values is constant, Group replacement of items that fail completely

Unit – II (15)
Inventory – Cost involved in inventory problems, variables in inventory problem, symbols in inventory concept of EOQ, Methods with calculus method
Model I (a) The economic lot size system with uniform demand.
Model I (b) Economic lot size with different rates of demand in different cycles.
Model I (c) Economic lot size with finite Rate of Replenishment.
(EOQ production model) EOQ model with shortages
Model II(a) The EOQ with constant rate of demand, scheduling, time constant.
Model II (c) The production lot size model with shortages.
Probabilistic inventory Models, Instantaneous demand, no set up cost model
Model VI(a) Discrete case
Model VI(b) continuous case
Problems on above models
Unit – III ,

Queuing Theory

Queuing systems , Queuing Problems: transient and steady states, traffic intensity .
Probability distributions in Queuing systems Poisson process, Properties ,
Exponential process.
Model I : ( M/M/I) : ( \(\infty\) /FCFS),
Model II (a) : General Erlang queuing model.
Model II (b) : ( M/M/I): ( \(\infty\) / SIRO ),
Model III : ( M/M/I): (N/FCFS),
Model IV : (M/M/S): ( \(\infty\) / FCFS)

Examples on all the above models. Problems

Unit – IV

Information Theory : Communication process, Quantitative measure of information, A
binary unit of information, measure of uncertainty of entropy, basic properties of
entropy function (H) Joint and conditional entropies, Uniqueness theorem, Chanel
capacity, efficiency and redundancy Encoding, Shannon Fano encoding procedure,
PERT / CPM : Applications of PERT /CPM techniques, Network diagram,
representations. Rules for constructing the Network diagram, determination of
the critical path, Problems

(vi) Recommended Books:

S.D.Sharma : Operations Research Kedarnath and co. 1999

(vii) References Books:-

(i) Paper – NMT - 404

(ii) Title Of Paper: Riemannian Geometry II

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I (15)
Ricci’s coefficients of rotation, Curvature of congruence, Geodesic congruences, commutation formula for second derivatives along the arcs of the enuple. Coefficients of rotation, condition for normal congruence, curl of a congruence, congruences canonical with respect to a given congruence

Unit – II (15)

Unit – III , (15)
Unit – IV


(vi) **Recommended Books:**


(vii) **References Books:**

1. J.A. Schouten: Ricci Calculus, Springer Verlag, Berlin

REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem IV)
(Introduced from June 2010 onwards)
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(i) Paper – NMT - 405
(ii) Title Of Paper: Fluid Mechanics II
(iii) Specific Objectives:
(iv) A brief note :- ()

(v) UNIT No. of Lectures
Unit – I (15)
Motion in two dimensions, stream function in two dimensions, two dimensional
irrotational incompressible flows, velocity derived from stream function, velocity in
polar co-ordinates complex potential function, some potential flows, Blasius theorem,
circle theorem.

Unit – II (15)
Sources, sinks and doublets in two dimensional flows, simple source in a uniform
flow, doublet in a uniform flow, method of images, images of a source about a
circular cylinder, image of a doublet in a plane, image of a doublet due to a circle.

Unit – III, (15)
Constitutive equation, viscosity, pressure, Newtonian hypothesis, Newtonian fluids,
deviatoric stress, equation of conservation of momentum.

Unit – IV (15)
Navier stokes equation, particular cases of Navier stokes equation. Boundary
layer theory, properties of Navier stokes equation, two dimensional boundary layer
equation. Displacement, momentum and energy thickness for two dimensional flow.

(vi) Recommended Books:
1) Rathy : An introduction to Fluid dynamics

(vii) References Books:-
1) G.K. Batherlo , An introduction to fluid Dynamics Cambridge University Press
   2000.
2) Andrew Robert Paterson, A first course in Fluid dynamics, Cambridge University press 2001

REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem IV)
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(i) Paper – NMT - 406

(ii) Title Of Paper: Combinatorics

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

Unit – I
1) The sum Rule and the product Rule
2) Permutations and combinations
3) The Pigeonhole Principle
4) Ramsey Numbers
5) Catalan Numbers
6) Stirling Numbers

Unit – II
1) Generalized Permutation and combinations
2) Sequences and selections
3) The Inclusion – Exclusion principle, Sieve’s formula
4) Derangements
5) System of Distinct Representatives (SDR)
6) Combinatorial Number theory

Unit – III, (15)

1) Rook- Polynomial
2) Ordinary and Exponential generating functions
3) Partitions of a positive integer
4) Recurrence Relations
5) Fibonacci sequence.

Unit – IV (15)

1) Group Theory in Combinatories
2) The Burnside Frobenius Theorem.
3) Permutation Groups and Their Cycle Indices
4) Polya’s Enumeration and Theorems.

(vi) Recommended Books:

1) V.K. Balakrishnan
Schum’s Outline of Theory and problems of combinatorics.
Schum’s Outline Series Mc. Grew Hill INC


(vii) References Books:-

1) Alan Tucker – Applied Combinatorics. – John Willey Sons.
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem IV)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 407
(ii) Title Of Paper: Automata Theory
(iii) Specific Objectives:
(iv) A brief note :- ()

(v) UNIT No. of Lectures
Unit – I (15)
Semigroup Relation, Semigroup, Group, Permutation group, Products and homomorphisms, Machine and semigroup State machines and their semigroups

Unit – II (15)
Homomorphisms of state machines, Quotients, Coverings. Mealy machine, Decompositions.

Unit – III (15)
Orthogonal partitions, Admissible partitions, Permutation-reset machines. Group machines

Unit – IV (15)
Connected transformation semigroups, Automorphism decompositions, Admissible subset system decomposition.

(vi) Recommended Books:
   (1982)

(vii) References Books:-
2) Eilenberg, S.: Automata, Languages and machine
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics ( Part II Sem IV)
(Introduced from June 2010 onwards)
( Regular and external )

(i) Paper – NMT - 408

(ii) Title Of Paper: Algebraic Number Theory

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

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<tr>
<th>Unit – I</th>
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<tbody>
<tr>
<td>Algebraic Numbers, Quadratic and cyclotomic fields : factorization into irreducibles</td>
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<th>Unit – II</th>
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<td>Euclidean quadratic fields, prime factorization of ideals</td>
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<th>Unit – III</th>
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<td>Lattices, Minkowski’s theorem, Geometric Representation of algebraic numbers</td>
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<th>Unit – IV</th>
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<td>class groups and class numbers, computational methods</td>
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(vi) Recommended Books:
1) Algebraic Number Theory by I.N. Stewart & D.O. Tall, Academic press. (Chapters 2 to 10)

(vii) References Books:-
1) Algebraic Number Theory : Mathematical Pamplet TIFR, Bombay
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics (Part II Sem IV)
(Introduced from June 2010 onwards)
(Regular and external)

(i) Paper – NMT - 409

(ii) Title Of Paper: Artificial Neural Networks and Genetic Algorithms

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures
Unit – I (15)
1) Fundamental concepts and Models of ANS. History of ANN, Biological Neuron, Artificial Neuron Mc-Culloch- Pitts Model, Neuron modeling for ANS.
2) Models of Artificial Neural Network, Feed forward network, feedback network, Neural processing.
3) Learning and adaptation, learning as approximation or equilibria encoding, supervised and unsupervised learning.

Unit – II (15)
1) Single- layer perceptron classifiers.
   Classification model, features and decision regions linear machines and minimum distance classification.
2) Nonparametric training concept, Training and classification using discrete perceptron : Algorithm and perceptron convergence theorem.
3) Example – Single layer continuous perceptron network for linearly Separable classification, 1
4) Multicategory single layer perceptron networks

Unit – III , (15)
1) Multi layer Feed forward Networks :
Linearly nonseparable classifications, XOR, XNOR and corner isolation problems. Delta learning rule for multilayer perceptron, Generalized delta learning rule.

2) Feed forward recall and error back propagation training, examples Training errors,

3) Learning factors : Initial weights, cumulative weight adjustment versus incremental updating, steepness of the activation function, learning constants, momentum method, Network architectures necessary number of Hidden neurons.


Unit – IV          (15)

GA and traditional methods
1) Introduction to GA, simple GA
2) G.A. Mathematical foundation
3) The fundamental theorem, two armed and K-armed bandit problem, similarity templates and hyperplanes
4) some applications of G.A. De Jong and function optimization, current applications.

(vi) Recommended Books:
   Jaico Publishing House, Mumabi (1997)
2) David E. Goldberg, Genetic Algorithm in Search, Pearson Education

(vii) References Books:-
1) Mehrotra , Ranka , Artificial Neural Networks, Penram International Publication.
2) Simon Haykins, Neural Networks, Pearson Publication
REVISED SYLLABUS FOR
M.A./M. Sc. Mathematics ( Part II Sem IV)
(Introduced from June 2010 onwards)
( Regular and external )

(i) Paper – NMT - 410

(ii) Title Of Paper: Integral Equations

(iii) Specific Objectives:

(iv) A brief note :- ()

(v) UNIT No. of Lectures

UNIT – I (15 Lectures)


UNIT – II (15 Lectures)

Fredholm equations: Solutions of homogeneous Fredholm integral equations, Eigen values and Eigen functions. Orthogonality and reality of eigen values, Fredholm integral equations with separable, Hermitian and symmetric kernels, Iterated kernels and properties, Fundamental properties of eigen values and eigen functions for symmetric kernels.
UNIT – III
(15 Lectures)

Operator method in the theory of integral equations, Truncated kernels and their properties, Hilbert – Schimdt Theorem Solutions of Fredholm integral equations by successive approximations – Resolvent or reciprocal kernel, Iterative method, Neumann series,

UNIT – IV
(15 Lectures)


(vi) Recommended Reading:


(vii) Reference Books

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