NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 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** :- **(v) UNIT No. of Lectures**

**Unit I** :

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**

The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform bounded ness principle, Definition and examples and simple properties of Hilbert spaces.

**Unit III**

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

**Unit IV**

self adjoint operators, Normal and unitory 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 Reading : (In MLA/APA Style Sheet Format)**


**a) Basic Reading:-** 1. G.F.Simmons : Topology and Modern Analysis, McGraw Hill (1963)

**b) Additional Reading:** G.Bachman and Narici : Functional Analysis, Academic Press 1964

**c) References i) Books:-** 1. A.E.Taylor : Introduction to Functional analysis, John Wiley and sons (1958)

2. A.L.Brown and Page : Elements of Functional Analysis, Van-Nastrand Reinehold com (1970)
3. B.V.Limaye : Functioned Analysis, New age international.
4. Erwie Kreyzig : Introduction to Functional Analysis with Applications, John Wiley and Sons.
5. J. B. Convey, Functional Analysis, Springer-Verlag.

**ii) Periodicals/Journals: Algebra Universlies, Journal of Pure and Applied Mathematics**


**(NOTE :**

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr. per week for problem solving/seminar/tutorial.**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

Nil

**NEW/REVISED SYLLABUS FOR**
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 302**

**(ii) Title Of Paper: Advanced Discrete Mathematics**

**(iii) Specific Objectives:** To introduce basic notions in Discrete Mathematics and use the results in developing advanced mathematics.

**(iv) A brief note** :- (At least introductory knowledge Differential Equations)

**(v) UNIT** **No. of Lectures**

**Unit – I**

Lattices: Definition and examples of posets and lattices, sublattices and direct products, Modular and distributive lattices, Homomorphisms, Boolean algebra and applications.

**(No. of Lectures 15)**

**Unit – II**

Graph Theory: Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, paths and cycles in a graph, connected graphs, The matrix representation of a graph, Fusion, **(No. of Lectures 15)**

**Unit – III** Trees: Definition and simple properties of a tree, bridges, spanning trees, cut vertices. Combinatorics: Basic counting methods, Inclusion exclusion principle.

**(No. of Lectures 15)**

**Unit – IV**

Pigeonhole principle, recurrence relations and generating functions,
Automata and Languages: strings, alphabets and languages, Finite state systems, Basic definitions, Non-deterministic finite automata. **(No. of Lectures 15)**

**(vi) Recommended Reading: (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-**

1. G. Grazer: General Lattice Theory.
2. John Clark and Derek Holton : A first book at Graph Theory Applied Publishers Ltd.
3. J.E. Hopcroft and Jeffery D. Ullman. Introduction to Automata theory, languages and computation Narosa publishing House, 1993.


**b) Additional Reading:**

1. Gorrett Birkhaff : Lattice Theory
2. Rich and Brualdi : Combinatorics


**c) References i) Books:-**

1. C. T. Liu : Discrete Mathematics
2. John C. Martin : Introduction to languages and the theory of computation Tata McGraw Hill Publishing Co,Ltd, New Delhi


**ii) Periodicals/Journals: Algebra Universlies, Order, Journal of Pure and Applied Mathematics**

**(NOTE :**

i) i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr. per week for seminar/tutorial/problem solving.**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

Nil

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II) Sem-III**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 303**
**(ii) Title Of Paper: Number Theory**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Review of divisibility : The division algorithm, G.C.D., Euclidean algorithm Diophonisne equation ax + by = C.
Primes and their distribution : Fundamental theorem of Arithmetic, The Goldback Conjecture **(No. of Lectures 15)**

**Unit – II** Congruences : Properties of Congruences, Linear congruences, Special divisibility tests.
Fermats theorem : Fermats factorization method, Little theorem, Wilsons theorem
Number theoretic functions : The functions $\tau$ and $\sigma$, The Mobius Inversion formula, The greatest integer function. **(No. of Lectures 15)**

**Unit – III** Eulers Generalization of Fermats 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 **(No. of Lectures 15)**

**Unit – IV** primitive roots for primes, composite numbers having primitive roots, The theory of Indices. The Quadratic reciprocity law : Euleri criteria, the Legendre symbol and its properties, quadratic reciprocity, quadratic reciprocity with composite moduli. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** D.M.Barton : Elementary Number Theory, Universal book stall, New Delhi.

**b) Additional Reading:** 1. S.B.Malik : Baisc Number theory Vikas publishing House.

**c) References i) Books:-** 1. George E.Andrews : Number theory, Hindusthan Pub. Corp.(1972) 2. Niven Zuckerman : An Introduction to theory of numbers.

**ii) Periodicals/Journals:**

**(NOTE :**

ii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

iii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II) Sem-III**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 304 :**

**(ii) Title Of Paper:**

**(iii) Specific Objectives:** **Commutative Algebra – I**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Minimal Prime and Primary Ideals : Examples and properties of Minimal, Prime and Primary Ideals. The nil radical of an ideal and its properties, semiprime ideals. The associated prime ideal of a primary ideal, Problems. (**No. of Lectures 15)**

**Unit – II** Minimal prime ideals of a ring.Certain Radicals of a Ring : Jacobson Radical, The definition of the idempotents of R/I can be raised or lifted into R and its properties, Primary rings, Problems. (**No. of Lectures 15)**

**Unit – III** Quasiregular element and its properties, Prime radicals, Modular ideals, J-radial of a ring. Boolean rings, Regular rings, Stone representation theorem. Direct sum of Rings, Problems. (**No. of Lectures 15)**

**Unit – IV** Birkhoff theorem , Rings with Chain conditions: Equivalence of three conditions of a ring with a.c.c., Hilbert Basis Theorem, Levitsky Theorem, Wedderburn Theorem, Problems. (**No. of Lectures 15)**

**Unit – V** Any semisimple Artinion ring R is the direct sum of a finite number of fields. Noetherion Rings : Noether theorem, A primary representation of an ideal, Cohens Theorem, Nakayama Lemma. The Krull intersection theorem, Problems.
(**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Barton David M. : A first course in Rings and Ideals Addison Wesley Publishing Company 1970.

**b) Additional Reading:** Oscar Zoriskiand P. Samuel : Commutative Algebra, Vol.I, Affilioted East Press Pvt. Ltd., New Delhi.

**c) References i) Books:-**
1. M.Atiyah and I.C. McDonald : Commutative Algebra.
2. Motsumura : Commutative Algebra.
3. C. Musili : Rings and Modules.

**ii) Periodicals/Journals:**

**(NOTE :**

iv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

v) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II) Sem-III**
**(Introduced from June 2009onwards)**

**(i) Paper – MT - 305**
**(ii) Title Of Paper: Fuzzy Mathematics - I**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit I) Crisp sets and fuzzy sets** (15 lectures)

1. The notion of fuzzy sets
2. Different notations describing a fuzzy set.
3. Basic concepts in fuzzy sets.
4. Algebra of fuzzy sets.

**Unit II) Level sets** (15 lectures)

1. Properties of level cuts.
2. Decomposition theorems.
3. Image and inverse image of a fuzzy set under a function.
4. Extension principle.

**Unit III) Triangular norms and co-norms.** (15 lectures)

1. Triangular norms – definition and properties.
2. Triangular co-norms – definition and properties.
3. Characterization theorems for triangular norms.
4. Characterization theorems for triangular co-norms.

**Unit IV) Fuzzy Arithmetic** (15 lectures)

1. Fuzzy numbers their characterizations.
2. Relationship between fuzzy numbers and closed intervals of real numbers.
3. Lattice of fuzzy numbers

**Recommended Books :**


1) Klir George J. and Yuan Bo, Fuzzy sets and Fuzzy logic. Theory and applications, Prentice Hall of India Pvt. Ltd. New Delhi. 1997.
2) Kaufmann A and Gupta M.M., Introduction to Fuzzy arithmetics, Van Nostrand.
3) Lowen R., Fuzzy set theory, 1996
4) Zimmerman H.J. , Fuzzy set theory and its applications, 1997
5) Pedrycz W. and Gomide F., An Introduction to fuzzy sets Analysis and Design. The MIT Press, Massachusetts 1998.


**ii) Periodicals/Journals:**
**(NOTE :**
vi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
vii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 306**

**(ii) Title of Paper: Distribution Theory**

**(iii) Specific Objectives: The objective of the paper is to introduce the Schwartz Distribution theory to students and thereby acquaint them the l inadequacy of the concept of function and ordinary calculus**

**(iv) A brief note** :- ( )

**(v) UNIT** **No. of Lectures**

**Unit 1.**Test Functions, Spaces D(R) & D (Ω), Convergence in D(R), Distributions, Regular & Singular Distributions, Pseudofunctions, Hadamard's Finite Part, Cauchy principal Value, Operations on Distributions, Problems **(No. of Lectures 15)**

**Unit 2.** , Distribution as Local Phenomena Convergence of Sequence of Distributions, Convergence Series of Distributions, Derivatives & Primitive of Distributions, Distribution as finite order derivative of a continuous function. Examples and problems. **(No. of Lectures 15)**

**Unit 3** Schwartz Space S (R) of testing functions of rapid descent, Convergence in S (R), Tempered Distributions, Operations on tempered Distributions, Bounded ness property of tempered distributions, Direct product of Distributions, Support of the direct product, Convolution Of Distributions **(No. of Lectures 15)** )

**Unit 4.**, Properties of convolutions, Regularization of Distributions, Convolution equations and distributional solutions, Examples and Problems
**(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Zemanian A.H.: Distribution Theory & Transform Analysis, McGraw Hill (1965)or Dover(1987).

**b) Additional Reading:** Pathak R.S.: Course in Distribution Theory & Applications, Narosa (2001).

**c) References i) Books:-** 1) Al-Gwaiz M.A., Theory of Distributions, Marcel-Dekker (1992).
2) Kanwal R.P., Generalized Functions; Theory & Techniques, Academic Press (1983).
3) Keshavan S.: Topics in Functional Analysis & Applications, Wiley Eastern (1989).
4) Walter Rudin: Functional Analysis, Tata McGraw Hill (1974).

**ii) Periodicals/Journals:**

**(NOTE :**
viii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
ix) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II) Sem- III**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 307**

**(ii) Title Of Paper: Integral Equations**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT No. of Lectures**

**UNIT – I** Preliminary Concepts: Introduction, Some problems which give rise to integral equations, Classification of linear integral equations, Integro- differential equations, conversion of initial value problem to Volterra integral equation and boundary value problem to Fredholm integral equation, Definitions of separable (degenerate) kernels, Hermitian and symmetric Kernels, Leibnitz rule for derivative inside integration sign.

**15 Lectures**

**UNIT –II** Frdholm 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 symmetrid kernels, Iterated kernels and properties, Fundamental properties of eigen values and eigen functions for symmetric kernels. **15 Lectures**

**UNIT – III** Operator method in te 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, **15 Lectures**

**UNIT – IV** Green's function: Definition, Construction of Green's function and its use in solving boundary value problems Volterra equations: Solutions by successive approximations – Resolvent kernel of Volterra equations, Neumann series, iterative method, Convolution type kernels. Applications of Laplace and Fourier transforms to solutions of Volterra integral equations, Solution of Volterra integral equations of first kind. **15 Lectures**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1) Kanwal, R. P. Linear Integral Equation, Theory and Technique. (1971), Academic Press.

2) Chambers, L. G. Integral Equations, A Short Course. (1976), International Text Book Company.

3) Krasnov, M. A., et.al. Problems and exercises in Integral equations. (1971), Mir Publishers

**b) Additional Reading: 1)** Green, C. D. Integral Equation Methods. (1969), Thomas Nelson and sons.

**c) References i) Books:-** 1) Cochran, J. A. The Analysis of Linear Integral Equations. (1972), Mc Graw Hill Publcations

**ii) Periodicals/Journals:**

**(NOTE :**

x) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xi) General/Specific instructions for Laboratory safety should be given wherever necessary)

**NEW/REVISED SYLLABUS FOR**
**M.A./M. Sc. Mathematics ( Part II) Sem III**
**(Introduced from June 2009 onwards)**

(i) **Paper –** **MT - 308**

**(ii) Title Of Paper:** **Riemannian Geometry -I**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I**: 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.

(15 lectures)

**Unit II**: 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.

(15 lectures)

**Unit III**: Three index symbols, second derivatives of the $x's$ with respect to $\bar{x}'s$, 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.

(15 lectures)

**Unit IV**: 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. (15 lectures)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1. C. E. Weatherburn: An Introduction to Riemannian Geometry and Tensor Calculus, Cambridge University Press, (1963)

2. L. P. Eisenhart: Riemannian Geometry, University Press Princeton (1926)

**b) Additional Reading:** 1. J.A. Schouten: Ricci Calculus, Springer Verlag, Berlin

2. T. Y. Thomas: Concepts from Tensor Analysis and differential Geometry, Academic Press, New York

**c) References i) Books:-** 1. Differential Geometry, O' Neil

**2.** Differential Geometry, Nirmal Prakash

**ii) Periodicals/Journals:**

**(NOTE :**

xii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr per week for problem solving/Tutorials/seminars**

xiii) General/Specific instructions for Laboratory safety should be given wherever necessary)

Nil.

**M.A./M. Sc. Mathematics ( Part II) Sem-III**
**(Introduced from June 2009 onwards)**

(i) Paper – MT - 309

**(ii) Title Of Paper: General Relativity I**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I:** Review of the special theory of relativity and the Newtonian theory of gravitation. Distinction between Newtonian space and relativistic space. The conflict between Newtonian Theory of gravitation and special Relativity. Non-Euclidean space time. General Relativity and gravitation, desirable features of gravitational theory. Principle of equivalence and principle of covariance. (15 lectures)

**Unit II:** Transformation of co-ordinates. Tensor. Algebra of tensors. Symmetric and skew symmetric tensors. Contraction of tensors and quotient law.

Tensor Calculus: Christoffel Symbols, Covariant derivative. Intrinsic derivative. Riemannian Christoffel Curvature tensor and its symmetric properties. Bianchi identities and Einstein tensor.

(15 lectures)

**Unit III:** Riemannian metric. The Levi-Civita tensor, Dual tensor. Parallel transport and Lie derivative.

Geodesic: i) geodesic as a curve of unchanging direction ii) geodesic as the curve of shortest distance and iii) geodesic through variational principle. The first integral of geodesic and types of geodesics. Geodesic deviation and geodesic deviation equation.

(15 lectures)

**Unit IV**: Killing vector fields. Isometry. Necessary and sufficient conditions for isometry. Homogeneity and isometry. Maximally symmetric space-time. Einstein space.

(15 lectures)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1. J.V. Narlikar: Lectures on General Relativity and Cosmology. The Mac Millan com. (1978).

2. R. Adler, M. Bazin and M. Schiffer: Introduction to General Relativity, McGraw-Hill Book Com. (1975).

**b) Additional Reading:** 1. M. Carmeli: Classical Fields: General Relativity and Gauge Theory, A Wiley-Interscience Publication (1982)

2. J. L. Synge: The General Relativity, North Holland Publishing Com. (1976)

3. L.D. Landau and E.M. Lifshitz: The classical Theory of fields, Pergamon Press. (1980)

**c) References i) Books:-** 1. B.F. Shutz: A first course in General Relativity, Cambridge University Press. (1990).

2. H. Stepheni: General Relativity: An Introduction to the theory of gravitational field. Cambridge University Press. (1982)

**ii) Periodicals/Journals:**

**(NOTE :**

xiv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr. per week for tutorials/problem solving/seminars**

xv) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 310**
**(ii) Title Of Paper: Theory Of Computation**
**(iii) Specific Objectives:**
**(iv) A brief note** :-
**(v) UNIT** **No. of Lectures**

**Unit 1**: Finite automata. Regular sets, The pumping lemma for regular sets, closure properties of regular sets. **15 Lectures**
**Unit 2**: Decision algorithm for regular sets. The Myhill- Nerode theorem. Context Free grammars, Examples of familiar context free languages, unions concatenations and Kleene- * of CFLS. Derivation trees and ambiguity, an unambiguous CFG for algebraic expressions. **15 Lectures**
**Unit 3**: simplified and normal forms. Pushdown Automata (PDA), Deterministic pushdown automata. A PDA corresponding to a given context free grammar. A context free Grammar corresponding to a Given PDA. **15 Lectures**
**Unit 4**: Turing Machines, The Turing machine models, Computable languages and functions. Techniques for Turing machine construction, Modification to Turing machines, Turing machines as enumerators. **15 Lectures**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** John Hopcroft and J. Ullman : Introduction to Automata theory, Languages and Computation, Narosa Publishers 1993.
**b) Additional Reading:** John C. Martin: Introduction to Languages and the theory of computation, Tata McGraw Hill publishing company limited New Delhi 1998.

**c) References i) Books:-** K.L.P. Mishra and N.Chandrashekharan: Theory of computer Science, Prentice Hill of India Pvt. Ltd. 2001.

**ii) Periodicals/Journals:**
**(NOTE :**
xvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr. per week for seminar/tutorial/problem solving.**
xvii) General/Specific instructions for Laboratory safety should be given wherever necessary)
**NIL**

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part I)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 311**
**(ii) Title Of Paper: Graph Theory**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Trees and connectivity: Definitions and simple properties, Bridges, spanning trees, cut vertices and connectivity. Euler Tours (**No. of Lectures 15)**

**Unit – II** Euler Tours and Homiltonian Cycles: Eulertours, the chinese postman problem, Hamiltonion graphs. The travelling salesman problem. Matchings : Matchings and Augmenting paths (**No. of Lectures 15)**

**Unit – III** , The marriage problem The Personal Assignment problem, The Optimal Assignment problem, A chinese postman Problem, Postscript. Planer Graphs : Plane and Planar graphs, Eulers formula, Platonic bodies Kurotowskis theorem. (**No. of Lectures 15)**

**Unit – IV** Non Homiltonian plane graphs. The dual of a plane graph. Colouring : Vertex coloring, vertex coloring algorithms, critical graphs, cliques, Edge coloring, map coloring. Directed graphs: Definition, Indegree and outdegree, Tournaments.traffic flow. Networks : Flows and Cuts, The Ford and Fulkerson Algorithm, Separating sets (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Joh Clark and Derec Haltan : A first look at graph theory, Allied publishers Ltd. Bombay.

**b) Additional Reading:** Douglas B.West : Introduction to Graph Theory Pearson Education Asia.

**c) References i) Books:-** 1. F. Harary - Graph Theory, Narosa Publishing House (1989)

2. K.R.Parthsorthy : Basic Graph Theory, Tata McGraw Hill publishing Co.Ltd.New Delhi

**ii) Periodicals/Journals:**

**(NOTE :**

xviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xix) General/Specific instructions for Laboratory safety should be given wherever necessary)

**(i) Paper – MT - 312**

**(ii) Title Of Paper:**

**(iii) Specific Objectives:** **Operations Research – I**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Convex sets, supporting and separating hyperplanes convex polyhedra and polytope, extreme points, convex functions, generalised convexity and concavity. Linear Programming : Introduction to linear programming problems, optimal solutions of linear programming problem, Derivation of the simplex method, computational technique of a simplex method, Resolution of degeneracy, revised simplex method, Duality in linear programming. The dual simplex method (**No. of Lectures 15)**

**Unit – II** Integer Programming: Importance of integer Programming problems, Solutions of IPP, Gomorys all IPP Method, Construction of Gomorys Constraints Computational procedure for the solution of IPP by Gomorys Method, The Branch and Bound method. (**No. of Lectures 15)**

**Unit – III** Dynamic programming: Belmans principle of optimality, solution of problems with a finite number of stages, the concept of dynamic programming, **Problems.** Application of dynamic programming in production, inventory control and solving linear programming problems. (**No. of Lectures 15)**

**Unit – IV** Non liner programming problems: The general Linear Programming problems of constrained maxima and minima, Quadratic Programming: General quadratic programming problem, Kuhn Tucker conditions of quadratic programming problems, Examples based on Wolfe's method and Beale's method, **Problems** (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** S.D.Sharma : Operations Research, Kedar Nath Ram Noth and co.

**b) Additional Reading: 1.** Kanti Swarup , P.K.Gupta and Manmohan : Operations research, S.Chand & Co.

2. Hamady Taha : Operations Research :Mac Millan Co.

**c) References i) Books:-** 1.S.D.Sharma :Linear programming, Kedarnath,Romnath & Co.

2. S.D.Sharma : Nonlinear and Dynamic programming Kedar Nath Ram Nath and Co. Meerut

3. R.K.Gupta : Operations Research Krishna Prakashan Mandir, Meeru

4. G.Hadley : Linear programming, Oxford and IBH Publishing Co.

5. S.I.Gass : Linear Programming, Mc Graw Hill Book Co.

**ii) Periodicals/Journals:**

**(NOTE :**

xx) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xxi) General/Specific instructions for Laboratory safety should be given wherever necessary)

**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 313**

**(ii) Title Of Paper: Lattice Theory -I**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I) Basic concepts** (15 lectures)

1. Posets.
2. Two definitions of lattices and their equivalence.
3. Description of Lattices.
4. Duality principle.
5. Homomorphism, Isomorphism and isotone maps.

**Unit II) Special types of Lattices** (15 lectures)

1. Boolean algebras and Boolean lattices.
2. Distributive lattices – Properties and characterizations.
3. Modular lattices – Properties and characterizations.
4. Boolean algebras – Properties and characterizations.

**Unit III) Ideal theory** (15 lectures)

1. Ideals and filters in lattices.
2. Lattice of all ideals I(L).
3. Properties and characterizations of I(L).
4. Stone's theorem and its consequences.

**Unit IV) Stone algebra** (15 lectures)

1. Pseudo complemented lattices.
2. S(L) and D(L) – special subsets of pseudo complemented lattices.
3. Distributive pseudo complemented lattice.
4. Stone lattices – properties and characterizations.

**Recommended Books :**

1) Lattice theory: First concepts and distributive lattices by George Gratzer, W. H. Freeman and company, San Francisco, 1971.

2)Lattice theory by G. Birkhoff, Amer. Math. Soc. Coll. Publications, Third Edition 1973

**ii) Periodicals/Journals:**

**(NOTE :**

xxii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xxiii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 314**
**(ii) Title Of Paper: Probability Theory**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Classes of sets, Field, Sigma field, Pi-class, Lambda-Class, Monotone Class and their inter-relationships, Lambda-Pi Theorem, Monotone-Class Theorem, Generated Sigma-fields and Borel Sigma-fields. Measurable and Measure spaces; Sigma-finite, finite and probability measure. Properties of Probability Measures, Labesgue and Lebesgue-Stieltjes Measures and their existence. **(No. of Lectures 15)**

**Unit – II** Functions; Inverse images, Properties of sets in terms of direct and inverse images, measurable functions, random variables and random vectors, simple and elementary random variables, Nonnegative random variables as limit of sequences of simple or elementary random variables, induced sigma-fields, induced probability spaces,distribution function. Existence of random variable on ( (0,1) B, Ω ) having the given distribution. (Skorohod representation theorem, only statement) **(No. of Lectures 15)**

**Unit – III** Integration with respect to a measure, Expectation of a random variable, Expectation in terms of probability distribution, Properties, of expectation. Independence of finite unmber of events; Sigma-filed, and random variables. Expectation of Product as product of expectations. Borel-Cantelli Lemma; Sequences of random variables, Various modes of convergence; their inter-ralationships, Monotone and Dominated convergence Theorems; Fatou's Lemma; Yulc-Sultskey Theorems. **(No. of Lectures 15)**

**Unit – IV** Weak Convergence and its properties, Helley-Bray Theorems; Characteristic Function and its properties. Inversion and Uniquencess Theorems; Convergence of Characteristic Functions; Continuity Theorem and its application. Weak Law of Large Numbers; Kolmogorov Inequalities; Strong Law of Large Numbers; Glivenko-Cantelli Theorem; Central Limit Theorems-Liappounoff's form and Lindeberg-Feller form. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Modern Probability Theory : Bhat B.R.

**b) Additional Reading:** Theory of Probability - Pasimal Mukhopethyay

**c) References i) Books:-** 1. Probability and Measure : Billingsley P.
2. Probilility Theory : Alen Karv.

**ii) Periodicals/Journals: (NOTE :**

xxiv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xxv) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 315**
**(ii) Title Of Paper: Approximation Theory – I**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Density Theorems : Approximation of peroidic functions : Fejers Theorem Approximation by Algebraic polynomials The Weierstrasstheorem - Bernstein polynomials, convergence of Bernsteins polynomials, Korovkins theorem, Problems. **(No. of Lectures 15)**

**Unit – II** The Stone Weiersttrass theorem, Linear Chebyshev Approximation Approximation in Normed linear spaces, Existence, uniqueness classical Theory, Problems. **(No. of Lectures 15)**

**Unit – III** The alternative theorem, Degree Approximation Moduli of continuity, Definition and Elementary properties, K- functionals Direct theorems, Jackson Kernels, Jackson and Favard Estimates, Converse theorems, Bernsteinsinequallty, Problems. **No. of Lectures 15)**

**Unit – IV** Converse theorems Approximation by algebraic polynomials, Pointwise estimates in direct theorems, Markov inequality and Related topics, converse theorems, Interpolation, Problems. **(No. of Lectures 15)**

**Unit – V** Algebraic formulation of finite interpolation Lagrange form, Extended Haar subspaces and Hermite interpolation, Hermite Feger interpolation Divided differences and the Newton form, Problems. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** Mhaskar H.N. and D.V.Pai : Fundamentals of Approximation Theory Narosa Publising House.
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
xxvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xxvii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 316**
**(ii) Title Of Paper: Spaces Dynamics - I**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Basic Formulae of a spherical trangle The Two body Problem : The Motion of the Center of Mass The relative motion. Kepler's equation. Solution by Hamilton Jocobi theory.
(**No. of Lectures 15)**

**Unit – II** The Determination of Orbits Laplace's Gauss Methods. The Three Body problem Genral Three Body Problem. Restricted Three Body Problem Jocobi integral.
(**No. of Lectures 15)**

**Unit – III** Curves of Zero velocity. Stationary solutions and their stability.
The n-Body Problem- The motion of the centre of Mass. Classical integrals.
Perturbation-Osculating orbit, **(No. of Lectures 15)**

**Unit – IV** Perturbing forces, Secular & Periodic perturbations. Lagrange's Planetory Equations in terms of pertaining forces and in terms of a perturbed Hamiltonian.
(**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** J.M.A. Danby, Fundamentals of Celestial Mechanics, The Macmillan Company 1962
**b) Additional Reading:** E.Finlay, Freundlich, Celestial Mechanics, The Macmillan Company 1958.
**c) References i) Books:- 1.** Theodore E.Sterne, An Introduction of Celestial Mechanics, Intersciences Publishers. INC 1960.
2. Arigelor Miele, Flight Mechanics Vol. 1 Theory of flight paths, Addison Wesley Publishing Company Inc. 1962.

**ii) Periodicals/Journals: (NOTE :**
xxviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xxix) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT – 317**
**(ii) Title Of Paper: Topological Vector Spaces**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Filters Definition and examples of filters, ultrafilters, convergence of filters. Topological vector Spaces : Definition and examples of TVS Absorbing and balanced sets (**No. of Lectures 15)**

**Unit – II** Characterization of TVS, Housdorff T.V.S Locally convex spaces : convex sets, LCS Characterization of L.C.S. Semi norms, Locally convex topology defined by semi norms (**No. of Lectures 15)**

**Unit – III** Minkowski functionals and locally convex topology, localy convex Housdorff spaces. Linear maps, Subspaces and Quotient spaces. Continuous linear maps, Uniform continuous linear maps, isomorphisms (**No. of Lectures 15)**

**Unit – IV** strict morphisms, s ubspaces, properties of subspaces, quotient spaces,properties of quotient spaces. Bounded sets, normability and metrizability. (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** John Horwath : Topological Vector Spaces, Academic press

**b) Additional Reading:** A.Robertson & W.Robertson : Topological Vector Spaces, Cambridge University Press

**c) References i) Books:-** Walter Rudin : Functional Analysis, Tata McGraw Hill Publishing Compay 1996.

**ii) Periodicals/Journals:**

**(NOTE :**

xxx) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xxxi) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 318**
**(ii) Title Of Paper: Geometric Functional Analysis**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** I. Convexity in Linear spaces : Convex sets, convex functions, Basic separation theorems, cones and orderings Alternate for mulations of the separation principle, Some applications Extreme sets. (**No. of Lectures 15)**

**Unit – II** II. Convexity in Linear topological spaces :
Linear topological spaces, Locally convex spaces, convexity and Topology, Weak Topologies Extreme points (**No. of Lectures 15)**

**Unit – III** Convex functions and optimazation some applications.
III. Principles of Banach spaces: Completion, congruence (**No. of Lectures 15)**

**Unit – IV** Reffexivity ,The category theorems, The smulion theorems, The theorem of James, support points and smooth points. (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** Richard B. Holmes : Geometric functional Analysis, Springer Verlag 1955 and its application
**b) Additional Reading:** Bochamen Narici : Functional Analysis, Academic Press.
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
xxxii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xxxiii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009onwards)**

**(i) Paper – MT - 319**

**(ii) Title Of Paper: Fluid Mechanics - I**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Kinematics ; Lagrangian and Eulerian methods. Equation of continuity. Boundary surfaces. Stream lines. Path lines and streak lines Velocity potential. Irrotational and rotational motions. Vortex lines. (**No. of Lectures 15)**

**Unit – II** Equations of Motion-Lagrange's and Euler's equations of motion. Bernoulli's theorem. Equation of motion by flux method. Equations referred to moving axes. Impulsive actions. Stream function. Irrotational motion in two-dimensions. **(No. of Lectures 15)**

**Unit – III** Complex velocity potential. Sources, sinks, doublets and their images. Conformal mapping. Milne- Thomson circle theorem. Two dimensional irrotational motion produced by motion of circular (**No. of Lectures 15)**

**Unit – IV** co-axial and elliptic cylinders in an infinite mass of liquid. Kinetic energy of liquid. Theorem of Blasius. Motion of a sphere through a liquid as rest at infinity. Liquid streaming past a fixed sphere. Equation of motion of a sphere. Stoke's stream function.

(**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** F.Chorlton, :Textbook of Fluid Dynamics, CBS Publishers, Delhi

**b) Additional Reading:** L.D.Landau and E.M.Lipschitz, : Fluid Mechanics, Pergamon Press, London 1985.

**c) References i) Books:-** 1. W.H.Besaint and A.S.Ramsey : A Treatise of Hydromechanics, Part II, CBS Publishers, Delhi 1988.

2. G.K.Batchelor, : An Introduction to Fluid Mechanics, Foundation Books, New Delhi 1994.
3. A.J.Chorin and A.Marsden : A Mathematical Introduction of Fluid Dynamics, Springer-Verlag. New York 1993
4. H.Schlichting, Boundary Layer Theory, McGraw Hill Book Company New York 1979
5. R.K.Rathy,: An Introduction to Fluid Dynaics, Oxford and IBH Publishing Company, New Delhi 1976
6. A.D.Young: Boundary Layers, AIAA Eaucation Series, Washington DC 1989
7. S.W.Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Private Limited, New Delhi 1976.

**ii) Periodicals/Journals: (NOTE :**

xxxiv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xxxv) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 320**
**(ii) Title Of Paper: Magneto Fluid Dynamics - I**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Maxwell's electromagnetic field equations. Equation of motion of a conducting fluid. Energy equation. Magneto fluid dynamics approximations. Properties of MFD equations. MFD equations for special cases. Magnetic Reynolds number. Boundary conditions.
**(No. of Lectures 15)**

**Unit – II** Alfven's theorem. Magnetic body force. Ferraro's law of isorotation.
One dimensional flows-Quasi one dimensional assumptions. Equation of continuity. Equations for average electric current density, electric and magnetic fields. **(No. of Lectures 15)**

**Unit – III** Equations of motion and energy. Steady flow of inviscid, Viscous and heat conducting fluids. Viscous flows-Hartmann flow. Hydromagnetic couette flow. Hydromagnetic Flow through an annulus **(No. of Lectures 15)**

**Unit – IV** Hydromagnetic flow in a rotating annulus. MFD pipe flow. MFD boundary layer approximaitons. MFD Flow past on infinite flat plate. MFD flow past a semi-infintie flat plate. MFD Rayleigh problem. MFD wakes. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** K.R.Cramer and S.I.Pai, : Magnetofluid Dynamics for Engineers and Physicists, Scripta Publishing Company, Washington D.C.1973

**b) Additional Reading:** S.I.Pai, Magneto gas Dynamics, and Plasmadynamics, Springer- Verlag, New York 1962

**c) References i) Books:-** 1. J.A.Shercliff, Magneto hydrodynamics, Pergamon Press London 1965
2. F.Chorlton, Text book on Fluid Dynamics, CBS Publications, Delhi 1985
3. R.K.Rathy, An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi 1976.

**ii) Periodicals/Journals:**
**(NOTE :**
xxxvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xxxvii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 322**
**(ii) Title Of Paper: Computer Science**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** 1. C Fundamentals C char set, Identifiers and Keywords, Data types, Constants, Variables and Arrays, Declarations, Expressions, Statements.
2. Operations and Expressions Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, Conditional Operator.
**(No. of Lectures 15)**

**Unit – II** 3. Data Input and Output Getchar function, Putchar function, scanf function, printf function, gets function, puts function.
4. Control Statements: While statement, Do-while statement, For statement, Nested Loops, If Else statement, switch statement, break statement, Continue statement, comma opeartor, Goto statement. **(No. of Lectures 15)**

**Unit – III** 5. Functions: Defining a function, Accessing a function, Passing arguments to function, specifying arguments, Data types, Function Prototypes, Recursion.
6. Arrays: Defining an array, processing an array, Passing arrays to a function, Multidimensional arrays, Arrays and Strings.
7. Pointers: Fundamentals, Pointer declarations, Passing pointers to a function, Pointers and one dimensional arrays. **(No. of Lectures 15)**

**Unit – IV** 8. Structures : Defining a structure, processing a structure, Passing structures to a function. 9. Data Files Opening and closing a data file, Creating a data file, Processing a data file, Unformatted data files **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** C Programming by SCHAUM Series.
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
xxxviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xxxix) General/Specific instructions for Laboratory safety should be given wherever necessary)

**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 323**
**(ii) Title Of Paper: Advanced General Topology**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Arbitrary products of topological spaces, Tychonov theorem, Quatient spaces, Problems. Nets and filters. **(No. of Lectures 15)**

**Unit – II** Nets, subnets, cluster points, ultranets convergence of filters, Problems Paracompact spaces. Metrizible spaces **(No. of Lectures 15)**

**Unit – III** Urysonh's metrization theorm, Nagata Smirnov metrization theorm, Problems. Uniforms spaces: Diagonal uniformities, uniform covers **(No. of Lectures 15)**

**Unit – IV** uniform products and subspaces, Problems.Weak uniformalities, uniformizability and uniform metrizability, complete uniform spaces, Problems. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Stephen Willard : General Topology, Addison Wesley publishing co.1970.

**b) Additional Reading:** W.J.Parvin : Foundations of General topology Academic press.

**c) References i) Books:-**

1. Kelley J.L. : General Topology, Von, Nostrand, 1966
2. Thron W.J. : Topological structures, Holt Rine Hort and Winston 1966.
3. J.R.Munkres : Topology, Pearson Education.

**ii) Periodicals/Journals:**

**(NOTE :**

xl) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xli) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009onwards)**

**(i) Paper – MT - 324 :**
**(ii) Title Of Paper:**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**
**Unit – I** **(No. of Lectures 15)**

**Unit – II** **(No. of Lectures 15)**

**Unit – III** **(No. of Lectures 15)**

**Unit – IV** **(No. of Lectures 15)**

**Unit – V** **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-**
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
xlii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xliii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 325**

**(ii) Title Of Paper: Fluid Dynamics**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I) Physical properties of fluids and kinematics of fluids:**

Concepts of fluids, continuum hypothesis, density, specific weight, specific volume, pressure, viscosity, surface tension, Eulerion & Lagrangian methods of description of fluids, Equivalence Eulerian and Lagrangian method, General motion of a fluid element, Integrability and compatibility conditions, stream lines, path lines, streak lines, stream function, vortex lines, circulation.

**15 Lectures**

**Unit II) Stresses in fluids:**

Strain rate tensor, stress tensor, symmetry of stress tensor, Transformation of stress components from one co-ordinate system to another, principle axes and principle values of stress tensor. Newtonian fluids. **15 Lectures**

**Unit III) Conservation laws:**

Equation of conservation of mass, equation of conservation of momentum, Navier Stokes equation, equation of moment of momentum, Equation of energy, Basic equations in different co-ordinate systems, boundary conditions.

**15 Lectures**

**IV) Rotational and irrotational flows:**

Bernoullis's equation, Bernoullis equation for irrotational flows, Two dimensional irrotational incompressible flows, Blasius theorem, circle theorem, Sources and sinks, sources, sinks and doublets in two dimensional flows, Methods of images. **15 Lectures**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 'An introduction to Fluid Dynamics' R. K. Rathy, Oxford & IBH publishing company

**b) Additional Reading:** Text book of Fluid Dynamics' F. Chorton CHS Publishers, Delhi, 1985

**c) References i) Books:-** 1. Fluid Mechanics' L. D. Landay & E. M. Lipschitz Pergamon Press London 1985

2. Fluid Mechanics' Kurdu & Cohen, Elsevierpub 2004

**ii) Periodicals/Journals:**

**(NOTE :**

xliv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xlv) General/Specific instructions for Laboratory safety should be given wherever necessary)

**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 326**

**(ii) Title Of Paper:**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** **(No. of Lectures 15)**

**Unit – II** **(No. of Lectures 15)**

**Unit – III** **(No. of Lectures 15)**

**Unit – IV** **(No. of Lectures 15)**

**Unit – V** **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-**

**b) Additional Reading:**

**c) References i) Books:-**

**ii) Periodicals/Journals:**

**(NOTE :**

xlvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xlvii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II) Sem-III**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 327**
**(ii) Title Of Paper: Differential Geometry**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Vector space, Euclidean space E3. tangent vectors and vectors fields, frame fields, natural frame fields, curves in E and reparametrization of curves, standard curves, directional derivative one forms, differential forms. **(No. of Lectures 15)**

**Unit – II** Tangent, principal normal and binormal vector fields of standard curves, curvature and torsion functions, Frenet formulas, Frenet approximation of curves, osculating planes. Isometries of E3, orthogonal transformations, derivative map of isometries, orientation, covariant derivative **(No. of Lectures 15)**

**Unit – III** Coordinate patches, surface in E3, simple surface, cylinder surface, surface of revolution, parametrization of a region, parametrization of cylinder and surface of revolution, smooth overlapping patches, tangent and normal vector fields on a surface. **(No. of Lectures 15)**

**Unit – IV** The shape operator of surface M in E3, normal curvature, principal curvatures, Gaussian and mean curvatures, Umbilic points, fundamental forms of a surface, computational techniques, special curves on surface, asymptotic and geodesic curves. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** . O'Neill, B.: Elementary Differential geometry, Academic Press, London 1966

**b) Additional Reading:** Millman, R. and Parker, G.D. : Elements of differential geometry: Prentice-Hall of India Pvt. Ltd. 1977

**c) References i) Books:-** 1. Hicks, N. : Notes of differential geometry, Princeton University Press (1968) 2. Nirmala Prakash : Differential Geometry, Tata McGraw-Hill 1981

**ii) Periodicals/Journals:**

**(NOTE :**
xlviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xlix) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

(i) Paper – MT - 401

**(ii) Title Of Paper: Measure and Integration**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

UNIT – I

Measure and Integration: Measurable space, Measure space and its properties, finite, sigma finite and semi finite measures, complete measure space, Locally measurable sets, saturated measure.Measurable functions and their properties, Integration of a non negative simple function, Integration of a non negative extended real valued function, 15 contact hours

UNIT – II Fatou's lemma, Monotone convergence Theorem, Integrable functions and their properties, Lebesgue convergence Theorem ,Signed measure: Definition, Positive, negative and null sets and their properties, Hahn Decomposition, mutually singular measures, Jordan Decomposition, absolute or total variation of a signed measure, The Radon Nikodym theorem, Radon – Nikodym derivative, Lebesgue decomposition.

15 contact hours

UNIT – III Lp spaces and Riesz representation Theorem Outer measure and measurability, completeness of restriction of an outer measure on the class of measurable sets,.Measure on an algebra, Caratheodory extension Theorem, 15 contact hours.

UNIT – IV Inner measure and its properties Baire Borel sets and positive linear functional and Borel measures,Product measure, measurable rectangles, Cross sections and their measurabilities, Fubini's and Tonelli's theorems. 15 contact hours.

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1) Royden, H. L. Real Analysis. (2002) 3rd edition . Prentice Hall of India, New Delhi. 2. Simmons, G. F. Introduction to Topology and Modern Analysis. (1963). Mc Graw Hill Book Company, New Delhi.

**b) Additional Reading: 1)** Berberian, S. K. Measure and Integration. (1965) Mc Millan, New York. 2. Rana, I. K. An Introduction to Measure and Integration. (1997) Narosa Book Company.3. Halmos, P. K. Measure Theory. (1950) Van Nostrand.

**c) References i) Books:-** 1) Murkherjee, A and Pethoven, K. Real and Functional Analysis. (1978) Plenum Press.

2) Friedmann, A. Fondations of Modern Analysis. (1970), Helf Rienhart and Winston.

3) Zygmud, A. Measure and Integration. (1977). Marcel Dekker.

**ii) Periodicals/Journals:**

**(NOTE :**

l) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

li) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 402**

**(ii) Title Of Paper: Partial Differential Equations**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** First order Partial Differential Equations
Curves and surfaces, classification, linear equations of first order. Ptaffians, Problems. Compatible systems, **(No. of Lectures 15)**

**Unit – II** Charpits method Jacobi method, Integral surfaces through a given curve, quasi linear equations, nonlinear first order pde's, problems.
**(No. of Lectures 15)**

**Unit – III** Second order Partial Differential Equations
Classification, wave equations, vibrations, of a string, maximum and minimum principles, problems. Cauchy problems, **(No. of Lectures 15)**

**Unit – IV** Dirichlets problems and Neumann problems Harnacks theorem, problems. Greens theorem, Laplaces equations for n variables, families to equipotential surfaces, Kelvin's inversion theorem, problems.
**(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** T. Amarnath: An elementary course in Partial differential equations, Narosa publication, 1987.

**b) Additional Reading:** Frite John : Partial Differential Equations.

**c) References i) Books:-** 1. R.McOwen : Partial differential equations, Prentice Hall 1995

2. G.Folland : Partial Differential Equations Prentice Hall India 1995

**ii) Periodicals/Journals:**

**(NOTE :**

lii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

liii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 403**

**(ii) Title Of Paper: Banach Algebra**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Relatively compact sets, compactly continuous operators, finite dimensional operators, transformation that is bounded but not completely continuous, a type of transformation that is always completely continuous, Problems. Properties of completely continuous transformations **(No. of Lectures 15)**

**Unit – II** .

Spectra and the resolvent set, Approximate proper values, Banach algebra with identity, compactness of the spectrum, the resolvent operator, Problems Spectral radius and spectral mapping theorem for polynomials. **(No. of Lectures 15)**

**Unit – III** **T**he Gelfand theory. Sesquilinear functions, Problems. Spectral results for normal and completely continuous operators, **(No. of Lectures 15)**

**Unit – IV** numerical rangeThe Fredholm alternative theory, Problems. The spectral theorem for bounded, normal finite dimensional operators. Commutative Banach Algebras, ideals and homomorphisms, Problems.

**(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** G. Bachmon and Narice L, Functional Analysis, Academic press.

**b) Additional Reading:** Walter Rudin: Functional Analysis, Tata MeGrow Hill Publishing co. New Delhi.

**c) References i) Books:-**

1. B.V. Limaye: Functional Analysis, New Age international limited Publications.
2. S.K. Berberian: Lectures in Functional Analysis and operator theory, Norosa Publishing House, New Delhi, 1979.

**ii) Periodicals/Journals:**

**(NOTE :**

liv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lv) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 404**

**(ii) Title Of Paper: Commutative Algebra - II**

**(iii) Specific Objectives:**

**(iv) A brief note** :-

**(v) UNITS**

**Unit I** Operations on Submodules, Isomorphism theorem for modules, Artirian and Noetherion modules. Composition series for modules,

**Unit II** the Krull-Schmidt theorem, Fittings, leamma, completely reducible modules, Schur's lemma. Free modules, injective modules,

**Unit III** projective modules, Direct sum and tensor product of modules.
Exact sequence and short exact sequence of modules,

**Unit IV** Uniqueness Theorem for primary decomposition of modules.
**Integral extensions:**
integral extensions, integral elements, Integrally closed sets, Finiteness of Integral closure, going up theorem, goning down theorem.

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:- 1.** N. Jacobson: Basic Algebra – II, Hindustan publishing corporation (India)

**b) Additional Reading: 1**. M. D. Larsen and P. J. McCarthy: Multiplicative theory of ideals, Academic press, 1971

2. D. G. Northcot, Ideal theory, Cambridge University, press, 1953

**c) References i) Books:-**

1. Oscar Zariski and P. Samual – Commutative Algebra, Vol I, Affiliated East West press pvt. Ltd. New Delhi.
2. M. F. Atiyah and I. G. MacDonald – Introduction to Commutative Algebra, Addison Wesley publishing company.

**ii) Periodicals/Journals:**

**(NOTE :** i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 405**
**(ii) Title Of Paper: Fuzzy Mathematics-II**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit I) Fuzzy Realtions** (15 lectures)

1. Crisp versus Fuzzy relations.
2. Binary Fuzzy relations.
3. Binary relations on a single set.
4. Fuzzy equivalence relations.
5. Fuzzy compatibility relations.
6. Fuzzy ordering relations.
7. Fuzzy Morphisms.
8. Supieorruposition of fuzzy relations.

**Unit II) Fuzzy Logic** (15 lectures)

1. Classical logic, Multi valued logic, Fuzzy propositions, Fuzzy quantifiers.
2. Inference form conditional Fuzzy propositions.
3. Inference form conditional and qualified propositions.
4. Inference form quantified propositions.

**Unit III) Fuzzy subgroups** (15 lectures)

1. Fuzzy subgroups.
2. Normal Fuzzy subgroups.
3. Homomorphism and Isomorphism.

**Unit IV) Fuzzy Subrings** (15 lectures)

1. Basic concepts.
2. Fuzzy Ideals.
3. Maximal fuzzy ideals and irreducible ideals
4. Prime and semi-prime fuzzy ideals

**Recommended Books :**


1) Klir George J. and Yuan Bo, Fuzzy sets and Fuzzy logic. Theory and applications, Prentice Hall of India Pvt. Ltd. New Delhi. 1997.
2) Elements of L – Algebra: Lecture notes in fuzzy Mathematics and Computer science, by Shin – Chuen Cheng, J. N. Mordeson, Yu Yandong. Creighton University, Omaha. Nebraska USA, 1994.
3) Fuzzy Group theory, by J. N. Mordeson, K. R. Bhutani and A. Rosenfeld., Springer – Verlag, 2005.


**(ii) Periodicals/Journals:**
**(NOTE :**
lvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
lvii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 406**

**(ii) Title Of Paper: Transform Analysis**

**(iii) Specific Objectives: The objective of the paper is to expose students to**

**Fourier and Laplace transforms of Schwartz Distributions and their advantages over the classical transforms together with the applications to initial and boundary value problems. The Sobolev spaces and the periodic distributions will also be introduced**.

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit 1**.Fourier transform on $L^1(R)$ space, Properties of Fourier transform on $L^1(R)$ space ,Fourier transforms of some useful functions, Fourier Inversion Theorems in $L^1(R)$ and D'(R) spaces, Fourier Transform of testing functions of rapid descents and inversion theorem . (15)

**Unit 2**. F, Fourier transform on $L^2(R)$ space, Fourier Transform of tempered distributions, Fourier transform of Convolution of distributions with bounded supports, The space Z and the space of ultradistributions, Fourier Transforms of arbitrary distributions, Fourier transform of Convolution of distributions, Applications of Fourier Transform (15)

**Unit 3**. Laplace Transform of functions, Existence Conditions for Laplace transform, Inversion Theorem, Properties of Laplace Transforms, Laplace Transformable Distributions, Inversion theorem, Convolution and Laplace Transform , Applications of Laplace Transforms (15)

**Unit 4.** Sobolev Spaces, Some properties of Sobolev Spaces, Fourier series and Periodic distributions. (15)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Zemanian A.H.: Distribution Theory & Transform Analysis, McGraw Hill (1965)or Dover(1987).

**b) Additional Reading:** Al-Gwaiz M.A., Theory of Distributions, Marcel-Decker

**c) References i) Books:-** 1) Pathak R.S.: Course in Distribution Theory & Applications,
2) Chandrasekharan K.: Classical Fourier Transform, Spinger-Varlag (1989).
3) Kanwal R.P.: Generalized Functions; Theory & Techniques, Academic Press (1983).
4) Keshavan S.: Topics in Functional Analysis & Applications, Wiley Eastern (1989).

**ii) Periodicals/Journals:**

**(NOTE :**

lviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 407**

**(ii) Title Of Paper: Wavelet Analysis**

**(iii) Specific Objectives:** The main objective of the paper is to introduce the Wavelet Analysis. The students will be acquainted with the Windowed Fourier transform and Continuous wavelet transform. The Multiresolution analysis and the construction of wavelet will be exposed to the students.

**(iv) A brief note** :- ()

**v) Unit** **Total No. of Lectures**

Unit1. Fourier Transform:
$L^1(R)$ and $L^2(R)$ spaces, Fourier transform on $L^1(R)$ and $L^2(R)$ spaces, Basic properties, Inversion theorem, Examples and problems (15)

Unit2. Paeseval's formulae and Uncertainty principle for the Fourier transforms, Limitations of the Fourier transforms, Windowed Fourier Transform (WFT,: Window functions, Basic Properties of WFT, Time Frequency Localization, Parseval identity and Reconstruction formula for WFT. Examples and problems (15)

Unit3. Uncertainty principle for WFT .Continuous Wavelet Transform (CWT): Wavelet, Construction of wavelet from known wavelets, Motivation And definition of CWT, Basic properties of CWT, Time Frequency Localization Parseval identity and Reconstruction formula for CWT, Examples and problems. (15)

Unit4. Orthonormal Wavelets, Multiresolution Analysis (MRA)

Motivation of MRA, Definition of MRA, Properties of scaling function,

Orthonormal wavelet bases, Construction of Orthonormal wavelets ,

Examples and problems (15)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Lokenath Debnath,Wavelet Transforms and Their Applications, Birkhauser(2002)

**b) Additional Reading:** C.K.Chui, an Introduction to Wavelets, Academic Press(1992)

**c) References i) Books:-** 1) G.Bachman, L. Narici & E.Beckenstein, Fourier and Wavelet analysis, Springer-verlag (2000)

2) G.Kaiser, A Friendly Guide to Wavelets,Birkhauser (1994)

**ii) Periodicals/Journals:**

**(NOTE :**

lix) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lx) General/Specific instructions for Laboratory safety should be given wherever necessary)

**NEW/REVISED SYLLABUS FOR**
**M.A./M. Sc. Mathematics ( Part II) Sem IV**
**(Introduced from June 2009 onwards)**

(i) **Paper –** **MT - 408**

**(ii) Title Of Paper:** **Riemannian Geometry -II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I**: 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 (15 lectures)

**Unit II**: Curvature of a Riemannian Space: Curvature Tensor and Ricci tensor, covariant curvature tensor, The identity of Bianchi. Riemannian Curvature of a $V_n$. Formula for Riemannian curvature. Theorem of Schur, Mean Curvature of a space for a given direction. Einstein space. (15 lectures)

**Unit III**: Hypersurfaces: Notations, unit normal, generalized covariant differentiation. Gauss's Formulae, second fundamental form. Curvature of a curve in a hypersurface. Normal curvature, Generalisation of Dupin's theorem. Principal normal curvature, Lines of curvature, conjugate directions and asymptotic directions in a hypersurface. (15 lectures)

**Unit IV**: Tensor derivative of the unit normal. Derived vector. The equations of Gauss and Codazzi, Hypersurfaces with indeterminate lines of curvature. Totally geodesic hypersurfaces, family of hypersurfaces. Riemannian curvature of a hypersphere. Geodesic in a space of positive curvature. Gauss formulae for subspace, curvature of a curve in a subspace. (15 lectures)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1. C. E. Weatherburn: An Introduction to Riemannian Geometry and Tensor Calculus, Cambridge University Press, (1963)

2. L. P. Eisenhart: Riemannian Geometry, University Press Princeton (1926)

**b) Additional Reading:** 1. J.A. Schouten: Ricci Calculus, Springer Verlag, Berlin

2. T. Y. Thomas: Concepts from Tensor Analysis and differential Geometry, Academic Press, New York

**c) References i) Books:-**

**ii) Periodicals/Journals: (NOTE :**

lxi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr. per week for problem solving/tutorials/seminars**

General/Specific instructions for Laboratory safety should be given wherever necessary)

**NEW/REVISED SYLLABUS FOR**
**M.A./M. Sc. Mathematics ( Part II) Sem IV**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 409**

**(ii) Title Of Paper: General Relativity II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I:** The action principle, the energy momentum tensor. The stress energy momentum tensor for perfect fluid, electromagnetic field. Einstein's field equations from action principle and its Newtonian approximation. Flat space and empty space. Local conservation laws associated with perfect fluid distribution. Schwarzschild space-time. Spherical symmetry. Einstein field equations under spherical symmetry. Schwarzschild exterior solution. Isotropic co-ordinates. Retarded time. Isotropic form of Schwarzschild exterior solution. **(15 lectures)**

**Unit II**: Planetary orbits and Kepler's laws, Relativistic analogues of Kepler's laws. Three crucial tests for general Theory of relativity: 1. Perihelion of the planet Mercury,
2. Bending of light, 3. Gravitational red shift. **(15 lectures)**

**Unit III**: The exterior calculus: The tangent space. Transformation properties of vector components. The co-tangent space. Basis in co-tangent space. Transformation laws of dual basis. Basis vector and 1-form.Tensor product and components of tensors. The law of transformation of tensors. Exterior product (wedge Product). Exterior derivative, p-forms. Hodge's star operator, Maxwell's field equations in Exterior form. **(15 lectures)**

**Unit IV**: Frame components of Riemannian Curvature tensor. Covariant differentiation. Ricci's rotation coefficients. Cartan's first equation of structure, Cartan's second equation of structure. Curvature 2-forms. Bianchi identities in tetrad form, Calculation of tetrad components of Riemannian tensor and Ricci tensor of spherically and axially symmetric metrics.

**(15 lectures)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** 1. J.V. Narlikar: Lectures on General Relativity and Cosmology.
The MacMillan com. (1978)
2. R. Adler, M. Bazin and M. Schiffer: Introduction to General Relativity, McGraw-Hill Book Com. (1975).
3. W. Israel : Defferential forms in General Relativity. (1970). Dublin University Press

**b) Additional Reading:** 1. Flander : : Defferential forms in General Relativity (19 )
2. Roy and Rajbali : Theory of Relativity (1992)

**c) References i) Books:-**
1. F. De Felice and C.J.S. Clarke: Relativity on curved Manifold, Cambridge University Press, (1990).
2. R.S. Mishra: A course in tensors, with applications to Riemannian Geometry. Pothishala Pvt. Ltd. (1985).

**ii) Periodicals/Journals: (NOTE :**

lxii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr. per week for problem solving/tutorials/seminars**

lxiii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 410**
**(ii) Title Of Paper: Automata Theory**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit 1**: Semigroup Relation, Semigroup, Group, Permutation group, Products and homomorphisms, Machine and semigroup State machines and their semigroups (Lecture 15)
**Unit 2**:, Homomorphisms of state machines, Quotients, Coverings. Problems Mealy machine, Decompositions. (Lecture 15)
**Unit 3**:, Orthogonal partitions, Admissible partitions, Permutation-reset machines. Problems. Group machines (Lecture 15)
**Unit 4**:, Connected transformation semigroups, Automorphism decompositions, Admissible subset system decomposition. Problems. (Lecture 15)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** Holcombe M. L.: Algebraic automata theory, Cambridge University Press.

**b) Additional Reading:** Arbib M. A. : Theory of abstract automata, Prentice Hall

**c) References i) Books:-** 1) Eilenberg, S. : Automata, Languages and machine
2) Ginburg A. : Algebraic theory of automata, Academic press.

**ii) Periodicals/Journals:**
**(NOTE :**
lxiv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **Seminars will be given to students.**
lxv) General/Specific instructions for Laboratory safety should be given wherever necessary)
**NIL**

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 410**
**(ii) Title Of Paper: Automata Theory**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit 1**: Semigroup Relation, Semigroup, Group, Permutation group, Products and homomorphisms, Machine and semigroup State machines and their semigroups (Lecture 15)

**Unit 2**:, Homomorphisms of state machines, Quotients, Coverings. Problems Mealy machine, Decompositions. (Lecture 15)

**Unit 3**:, Orthogonal partitions, Admissible partitions, Permutation-reset machines. Problems. Group machines (Lecture 15)

**Unit 4**:, Connected transformation semigroups, Automorphism decompositions, Admissible subset system decomposition. Problems. (Lecture 15)

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Holcombe M. L.: Algebraic automata theory, Cambridge University Press.

**b) Additional Reading:** Arbib M. A. : Theory of abstract automata, Prentice Hall

**c) References i) Books:-** 1) Eilenberg, S. : Automata, Languages and machine
2) Ginburg A. : Algebraic theory of automata, Academic press.

**ii) Periodicals/Journals:**

**(NOTE :**

lxvi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **Seminars will be given to students.**

lxvii) General/Specific instructions for Laboratory safety should be given wherever necessary)

**NIL**

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT -411**
**(ii) Title Of Paper: Combinatorics**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Basic Tools : The sum rule and product rule, permutations and combinations The Pigeonhole principle, Ramsay mumbers, catlan numbers, stirling numbers Further baisc tools **(No. of Lectures 15)**

**Unit – II** Generalized permutations and combinations sequences and selections, The inclusion and Exclusion principle, Systmes of distrinct representatives, solved problems Derangements and other constained arrangements combinatorial number Theory **(No. of Lectures 15)**

**Unit – III** The permonent of a matrix, Rook polynomials and Hit polynomials, SDR and coverings, (Sperners theorem and Symmetric chain decomposition, posets and Dilworths therem) Statements. Generating functions and Recurrence relations Ordinary and exponential Generating functions. **(No. of Lectures 15)**

**Unit – IV** Partitions of a positive integer, Recurrence relations Algebraic solutions of linear Recurrence relations with constant coefficients with solutions of recurrence relations using generating functions. Group Theory in Combinatorics: The Burnside Frobenius theorem, permutation groups and their Cycle indices, Polyas enumeration theorems **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** V.K.Balkrishnan : Combiactorics, Shaums Outlines Series, McGrow Hill Inc.

**b) Additional Reading:** Richard Brualdi - Introductory Combinatosics North Holland.

**c) References i) Books:-1.** V.Krishnamurthy: Combinatorics,E.W.Press
2. A.Tucker: Combinatorics.

**ii) Periodicals/Journals:**

**(NOTE :**
lxviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
lxix) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 412**
**(ii) Title Of Paper: Operation Research - II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Replacement Problems:
Replacement of major or capital items that deteriote with time,Replacement of a machine whose maintenance cost is increasing with time, to determine the best replacement age of a machine taking money value into consideration, to find the minimum value of fixed annual payment throughout the life of the machine, replacement of items in anticipation of complete failure, the probability of which increases with time, Problems **(No. of Lectures 15)**

**Unit – II** To determine the interval of optimal replacement, problems of mortality and staffing problem.
Inventory Control: Introduction, variables in on inventory problems, Need of inventory, inventory problems, advantages amd disadvantages of inventory classification of inventory models Some general notations used in inventory models, Economic lot size models. Problems Model I The economic lot size Model with uniform rate of demand infinite production rate and having no shortages.
Model II: Economic lot size model with different rates of demand in different cycles, infinte production rate and having no shortages. **(No. of Lectures 15)**

**Unit – III**
Model III : Economic lot size model with uniform rate of demand Finite rate of replacement having no shortages Deterministic models with shortages.
Model IV : Fixed time model.
Model V : Economic lot size model with uniform rates of demand
Infinite rate of production and having shortages which are to be fulfilled.
Model VI :Economic lot size model with uniform rates of demand
Infinite rate of production and having shortages which are to be fulfilled.
Model VII: Single period model with discontinuous or instantaneous demand and time in dependent cost.
Model VIII: Single period model with infinite demand.
Model IX : The general single period model of profit maximization With time independent cost.

Model X : Probabilisstic order level system with lead time Purchase Inventory model with price breaks. Problems Queuing Theory :
Basic Queuing process customers behavior in a queue, important difinitions and Queuing problem The state of the system , Poisson process, poisson arivals, clussification of Queuing models. Solution of Queuing models Model I : ( M/M/I) : ( ∞ /FCFS),
Model II: General Erleng quauing model.
Model III : ( M/M/I): (N/FCFS), (**No. of Lectures 15)**

**Unit – IV**

Model IV : (M/M/S): (∞/FCFS)
Model V : (M/EK/I) : (∞/FCFS),
Model VI : (M/EK/I) : (I/FCFS) Machine repair problem
Model VII: (M/M/R) : (K / GD) K < R
Examples on all the above models. Problems
Information Theory :
Communication process, Quantitative measure of information, A binary unit of information, measure of uncertainry of entropy, basic properties of entropy function (H) Joint and conditional entropies, Unaqueness theorem, Chanel capacity, efficientry and redundancy Encoding, Shanon Fano encoding procedure, A noiseless coding theorem (statement only) and applications.
PERT / CPM : Applications of PERT /CPM techniques, Network diagram, representations. Rules for constructing the Network diagram, determination of the critical path, Problems. (**No. of Lectures 15)**
Problems

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** S.D.Sharma : Operations Research Kedarnath and co. 1999
**b) Additional Reading:** Homady Taha : Operations Research, Mc millon and Co.
**c) References i) Books:-** 1. J.K. Sharma : Operations Research, Mocmillan India Ltd. 1999.
2. R.K.Gupta : Operations research, Krishna Prakashan Mandir, 1999

**ii) Periodicals/Journals:**

**(NOTE :**

lxx) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
lxxi) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT -413**
**(ii) Title Of Paper: Lattice Theory -II**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit I) Universal algebra** (15 lectures)

Universal algebra, Sub algebras, morphisms, congruence relations, Funayama –
Nakayama theorem, Direct and sub direct product of sub algebras.

**Unit II) Applications to Algebra** (15 lectures)

Modules, Groups with operations, permutable congruence relations, Direct decompositions, Jordon – Holder theorem, Kurosh – Ore theorem, Ore's theorem, sub
group lattices.

**Unit III) Applications to General Topology** (15 lectures)

Topological spaces, Lattice of open and closed sets, Regular open sets, T1 lattices, Bases, sub bases and compactness in lattices, Stone's representation theorem,
Wallman's theorem.

**Unit IV) Metric lattice and Topological lattices.** (15 lectures)

Valuations, Quasi metric lattices, metric lattices, metric completion, distributive valuation.

**Recommended Books :**


1) Lattice theory: First concepts and distributive lattices by George Gratzer, W. H. Freeman and company, San Francisco, 1971.
2) Lattice theory by G. Birkhoff, Amer. Math. Soc. Coll. Publications, Third Edition 1973.


**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**ii) Periodicals/Journals:**
**(NOTE :**

lxxii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxiii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 414**

**(ii) Title Of Paper: Mathematical Statistics**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Distribution function, its properties; Distribution function of a random variable; Standard distribution functions and their relation to uniform distribution; Decomposition theorem for distribution functions; Functions of random variables and their distributions. **(No. of Lectures 15)**

**Unit – II** Expectation and moments and their evaluation; Probability generating function; moment generating function; and characteristic function; their properties; concepts of mixture and convolutions. Moment inequalities : Markov, Chebychev **(No. of Lectures 15)**

**Unit – III** Holder Minkowski and Jensen inequalities and their applications. Random vector, joint marginal distributions, existence of many joint distributions with given marginals; independence and conditional distributions; joints p.m.f.(p.d.f) and joint characteristic functions. **(No. of Lectures 15)**

**Unit – IV** Multivariate distributions - multinomial, multivariate Poisson Beta distribution , bivariate exponential distributions; simple properties of the above distributions; joint p.m.f.(p.s.f) and joint characteristic functions. Exponential family of distributions, Power series distributions; Location and scale families, non-regular families; symmetric distributions; properties of these families in terms of moments; Order statistics, their joint distribution and marginal distributions. Distribution of range. Independence of spacings from exponential distributions. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Introduction to probability theory and Mathematical Statistics Rehatgi V.K.

**b) Additional Reading:** Distributions in Statistics Vol. I,II, III, Johns N.I and S. Kolz

**c) References i) Books:-** Mathematical Statistics : Parimal Mukhopadhyay

**ii) Periodicals/Journals:**

**(NOTE :**

lxxiv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 415**
**(ii) Title Of Paper: Approximation Theory - II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Convexity concepts, Characterization of Best Uniform Approximation, Best Approximation in Normed linear spaces : Approximate properties of sets, Basic definitions and preliminaries,Existence, uniqueness, Problems. Geometric Notions in Banach spaces related to existence and uniqueness. **(No. of Lectures 15)**

**Unit – II** Characterization and duality; Basic characterization theorems, Extremal representations, Best Approximants from finite dimensional subspaces characterization of extreme functionals, Problems.Application to concrete spaces. Continuity of metric projections: Rutiments of multifunctions,**(No. of Lectures 15)**

**Unit – III** upper semicontinuity of metric projections, Lower semicontinuity continuous selections and Lipschitz Continuity of metric projections, continuity of chebyshev maps and linear selections for metric projections, Problems. Convexity Solarity and Chebyshevity of sets: Convexity, **(No. of Lectures 15)**

**Unit – IV** soloxity and Lunasity, convexity of sums, Soloxity of Chebyshev sets, Problems.

Best simultoneous approximation: Existence of restricted centres, The successive Approximation Technique Characterization and duality results, Uniqueness and stability Optical recovery: General theory, Problems.

**(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** H.N.Mhaskar and D.V.Pai: Fundamentals of Approximation Theory - Narosa Publishers, New Delhi.

**b) Additional Reading:** R.Holmes: A Course on optimization and Best Approximation, Springer Verlag.

**c) References i) Books:-** R.Holmes: A Course on optimization and Best Approximation, Springer Verlag.

**ii) Periodicals/Journals:**

**(NOTE :**

lxxv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxvi) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 416**

**(ii) Title Of Paper: Space Dynamics - II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Motion of the moon - The perturbing forces, Perturbations of Keplerian elements of the Moon by the Sun. **(No. of Lectures 15)**

**Unit – II** Flight Mechanics Rocket Performance in a vacuum. Vertically ascending paths. Gravity Twin trajectories. Multi stage rocket in a vacuum. Definitions pertinent to single stage rocket **(No. of Lectures 15)**

**Unit – III** Performance limitations of single stage rockets. Definitions pertinent to multistage rockets. Analysis of multistage rockets neglecting gravity. Analysis of multistage rockets including gravity **(No. of Lectures 15)**

**Unit – IV** Rocket Performance with Aerodynamic forces. Short range non-lifting missiles. Ascent of a sounding rocket. Some approximate performance of rocket powered air-craft. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** J.M.A.Danby : Fundamentals of Celestial Mechanics, The Macmillan Company, 1962

**b) Additional Reading:** E.Finlay : Freundlich : Celestial Mechanics, The Macmillan Company, 1958

**c) References i) Books:-**

1. Theodore E.Sterne : An Introduction of celestial Mechanics, Intersciences Publishers. INC 1960
2. Arigelo Miele; Flight Mechanics Vol. I, Theory of flight paths Addison Wesley Publishing company Inc. 1962.

**ii) Periodicals/Journals:**

**(NOTE :**

lxxvii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxviii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009onwards)**

**(i) Paper – MT – 417**
**(ii) Title Of Paper: Algebraic Number Theory**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Algebraic Numbers, Quadratic and cyclotomic fields : factorization irreducibles **(No. of Lectures 15)**

**Unit – II** Euclidean quadratic fields, prime factorization of ideals **(No. of Lectures 15)**

**Unit – III** Lattices, Minkowski's theorem, Geometric Representation of algebraic numbers **(No. of Lectures 15)**

**Unit – IV** class groups and class numbers, computational methods **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Algebraic Number Theory by I.N. Stewart & D.O. Tall (Chapters 2 to 10)

**b) Additional Reading:** Algebraic Number Theory : Mathematical Pamplet TIFR, Bombay

**c) References i) Books:-**

**ii) Periodicals/Journals:**

**(NOTE :**

lxxix) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxx) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 419**

**(ii) Title Of Paper: Harmonic Analysis**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**Unit I Fourier Analysis:**

Fourier series, point wise and uniform convergence of Fourier series, fourier transforms, Riemann Labesuge lamma, Inversion theorem, Preseval identity, Planchard theorem. Analytic properties of functions from C to Banach algebras **(No. of Lectures 15)**

**Unit II Elements of Banach Algebra:**

maximal ideal space, Getfand Topology. Definition, Basic properties, subgroups, quotient Group, locally compact topological groups. **(No. of Lectures 15)**

**Unit III Topological Groups:**

Quotient Group, locally compact topological groups, examples. Haar covering function and its properties, Right Haar measure, its existence and uniqueness on locally compact topological group. **(No. of Lectures 15)**

**Unit IV Haar integral:**

Haar integral, Examples of Haar measures, character, dual groups. **Generalization of Fourier Transform:** Fourier transform on L′ (G) and L* (G) (G being a locally compact topological group) Positive definite functions, Bochner Characterization Inversion formula, plancherd theorem, Pontrajagin Duality theorem. **(No. of Lectures 15)**

**Recommended Book:**

Bachaman G: Elements of Harmonic Analysis, Academic Press.

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 419**
**(ii) Title Of Paper:**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**
**Unit – I** **(No. of Lectures 15)**

**Unit – II** **(No. of Lectures 15)**

**Unit – III** **(No. of Lectures 15)**

**Unit – IV** **(No. of Lectures 15)**

**Unit – V** **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-**
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
lxxxi) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
lxxxii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 420**

**(ii) Title Of Paper: Magneto Fluid Dynamics- II**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Magneto Fluid Dynamics, Wave Phenomena- Electromagnetic Waves Gas dynamic Waves, Magneto gas dynamic Waves **(No. of Lectures 15)**

**Unit – II** Sub and Super Alfven's Waves, Waves of finite amplitude, Normal and Oblique MFD Shock waves. **(No. of Lectures 15)**

**Unit – III** MFD Applications - Astrophysical and geophysical applications. MFD ejectors, MFD accelerators, MFD Lubrication, MFD thin airfoil MFD power generation. **(No. of Lectures 15)**

**Unit – IV** Tensor electrical conductivity. Hall current and ion slip. MHD channel flow and quasi one dimensional flow with tensor electrical conductivity. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** K.R.Cramer and S.I.Pai, Magnetofluid Dynamics for Engineers and Physicists, Scripta Publishing Company, Washington D.C. 1973

**b) Additional Reading:** S.I.Pai, Magneto gas Dynamics, and Plasmadynamics, Springer Verlag, New York, 1962

**c) References i) Books:-**


1. J.A.Shercliff, Magneto hydrodynamics, Pergamon Press, London, 1965
2. F.Chorlton, Text book on Fluid Dynamics, CBS Publications, New Delhi 1985
3. R.K.Rathy: An Introduction to Fluid Dynamics, Oxford & IBH Publishing company, New Delhi 1976


**ii) Periodicals/Journals:**

**(NOTE :**

lxxxiii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxxiv) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 421**
**(ii) Title Of Paper: Mechanics of Solids -II**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** Analysis of strain : Affine transformations, Infinitesimal Affine deformations, A geometrical interpretation of the Components of strain, Polar and Cyllindrical Co-ordinates, Strain Quadratic of Cauchy (**No. of Lectures 15)**

**Unit – II** Principal Strains, Invariants. Examples of Strain, Equations of Compatibility. Analysis of Stress : Body and Surface forces, Stress tensor, Equations of Equilibrium, Polar and Cyllindrical Co-Ordinates, Stress quadric (**No. of Lectures 15)**

**Unit – III** Examples of Stress, equations of Elasticity: Hooke's law, Generalized Hookes Law, Homogeneous Isotropic Media, Elastic Moduli for Isotropic Media (**No. of Lectures 15)**

**Unit – IV** Simple Tensor, Pure Shear, Hydrostatic Pressure, Beltrami Michell Equations, Biharmonic Functions, Strain Energy Function and Hooke's Law. (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Sokolnikoff, I.S. Mathematical Theory of Elasticity

**b) Additional Reading:** Landau L.D. and Lifshitz E.M.: Theory of Elasticity, Pergamon Press.

**c) References i) Books:-** 1. Love, A.E.H.: A Treatise on Mathematical Theory of Elasticity, Cambridge University Press.
2. M.Ray. Theory of Elasticity, S.Chand and Company, New Delhi
3. Filonenho, M. and Borodich, Theory of Elasticity, Peace Publishers.

**ii) Periodicals/Journals: (NOTE :**

lxxxv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxxvi) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 422**
**(ii) Title Of Paper: Programming in C++**
**(iii) Specific Objectives:**
**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**

**Unit – I** 1. Principles of Object Oriented Programming Basic concepts, Benefits of OOP, Applications of OOP. 2. Tour of C++ , Structure of a C++ program, a simple C++ program, an example with class. **(No. of Lectures 15)**

**Unit – II** 3. Tokens, Expressions and control structures Tokens, Keywords, Identifiers, Basic data types, user defined, data types, Derived data types, constants, Reference variables, Scope, Resolution operator, manipulators, operator overloading. 4. Classes and objects Class, Member functions, A C++ program with class, Nesting of member functions, private Member functions, Arrays with a class, Arrays of objects, Objects as function arguments, Returning objects, Constructors and Destructors, Friends to a class. **(No. of Lectures 15)**

**Unit – III** 5. Operator Overloading Defining operator overloading, overloading Unary operators, overloading Binary operators, Rules for overloading operators. 6. Pointers Introduction, Pointers to objects, this pointer, Pointers to classes. **(No. of Lectures 15)**

**Unit – IV** 7. Inheritance - Defining derived classes, Single Inheritance, Making a private member inheritable, Multiple Inheritance.
8. Working with Files Introduction, Opening and closing a file, Detecting End-of-File, Files modes, Files pointers, Sequential input and output operations, Updating a file, Command Line Arguments. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-** Title : Object Oriented Programming with C++ , E Balagurusamy, Tata McGraw Hill
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**

lxxxvii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 423**

**(ii) Title Of Paper: Algebraic Topology**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** Geometric complexes and polyhedra : Orientation of Geometric Comlexes, incidence number, Problems.Simplicial homology groups : Chains, cycles **(No. of Lectures 15)**

**Unit – II** **B**oundaries of homology groups, Examples of homology groups, The structure of homology groups, The Euler Poincare theorem, Problems. Eulers theorem, Pseudomanifolds and Homology groups of $S^n$.Simplicial Approximation : The simplicial mapping and its properties **(No. of Lectures 15)**

**Unit – III** , 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- Poincore theorem **(No. of Lectures 15)**

**Unit – IV** .The fundamental Groups : Homotopic paths and fundamental groups, Problems. The covering Homotomy property for $S^1$, The covering path property, The relation between H(K) and $\pi_1$ (|k|) Covering spaces: Basic properties of covering spaces, Problems. **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Croom F.H. : Basic concepts in Algebraic Topology, Springer Verlag 1978)

**b) Additional Reading:** E.H.Spanier : Algebraic Topology, McGraw Hill, New York 1967

**c) References i) Books:-** 1. W.S.Massey : Algebraic Topology an introduction, Harcourt Broce and World Inc. N.Y.,

2. Wollace, A.H. : An introduction to Algebraic Topology, Pergaman Press Oxford.

**ii) Periodicals/Journals:**

**(NOTE :**

lxxxviii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

lxxxix) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR

**M.A./M. Sc. Mathematics ( Part II)**

**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 424**

**(ii) Title Of Paper:**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit – I** **(No. of Lectures 15)**

**Unit – II** **(No. of Lectures 15)**

**Unit – III** **(No. of Lectures 15)**

**Unit – IV** **(No. of Lectures 15)**

**Unit – V** **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-**

**b) Additional Reading:**

**c) References i) Books:-**

**ii) Periodicals/Journals:**

**(NOTE :**

xc) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xci) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 425**

**(ii) Title Of Paper: Computational Fluid Dynamics**

**(iii) Specific Objectives:**

**(iv) A brief note** :- ()

**(v) UNIT** **No. of Lectures**

**Unit I)** Comparison of experimental, Theoretical and numerical approaches, Governing equations, continuity equation, momentum equation (in viscid, viscous flows) energy equation, dynamic similarity incompressible viscous flow, laminar boundary layer flow.
(**No. of Lectures 15)**

**Unit II )**
Nature of a well posed problems, physical classification and Mathematical Classification of partial differential equations hyperbolic, parabolic, elliptic partial differential equations, traditional solution method, separation of variables, generalized curvilinear co-ordinates, Transformation relationships, Evaluation of transformation parameters, centered difference formula, Generalized co-ordinates structure of first and second order partial differential equation. (**No. of Lectures 15)**

**Unit III)** Stability, Convergence & consistency at finite difference scheme, Explicit form of heat equation, Crank Nicolson method, Von Neumann analysis, Euler's explicit method for wove equation, Upstream differencing method, Lax method, Euler implicit method, Finite difference representation of Lap lace equation, five point method.
(**No. of Lectures 15)**

**Unit IV)** Burgers equation (in viscid ) Lax method, implicit methods, Burgers
equation (viscous) FTCS method, Briley – Mc Donald method, Convergence and stability, Grid generation, orthogonal gird generation, order of magnitude analysis, flow in a straight rectangular duct, flow in a curved rectangular duct. (**No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**

**a) Basic Reading:-** Computational Techniques for Fluid Dynamics Vol. I & II, C. A. Fletcher Springer Verlag 1988.

**b) Additional Reading:** Computational Fluid Dynamics' Chung 2002 Cambridge University, Press.

**c) References i) Books:-** 'Computational Fluid Mechanics & Heat Transfer' Dale A Andeerssr, John Tannelhill, R. H. Fletcher, Hemisphere publishing corporation 1984.

**ii) Periodicals/Journals:**

**(NOTE :**

xcii) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

xciii) General/Specific instructions for Laboratory safety should be given wherever necessary)

NEW/REVISED SYLLABUS FOR
**M.A./M. Sc. Mathematics ( Part II)**
**(Introduced from June 2009 onwards)**

**(i) Paper – MT - 426**
**(ii) Title Of Paper:**
**(iii) Specific Objectives:**

**(iv) A brief note** :- ()
**(v) UNIT** **No. of Lectures**
**Unit – I** **(No. of Lectures 15)**

**Unit – II** **(No. of Lectures 15)**

**Unit – III** **(No. of Lectures 15)**

**Unit – IV** **(No. of Lectures 15)**

**Unit – V** **(No. of Lectures 15)**

**(vi) Recommended Reading : (In MLA/APA Style Sheet Format)**
**a) Basic Reading:-**
**b) Additional Reading:**
**c) References i) Books:-**

**ii) Periodicals/Journals:**
**(NOTE :**
xciv) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.
xcv) General/Specific instructions for Laboratory safety should be given wherever necessary)