EIILM University

DIRECTORATE OF DISTANCE LEARNING

SYLLABUS BOOKLET
Year - I TO II

MASTER OF SCIENCE – MATH
(M.Sc – Math)

JAN 2010 ONWARDS

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – I

TOPOLOGY

Sub. Code: MSCM/Y/11O **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Metric Space: Definition, examples and basic concepts. Sub-spaces and products. Open sets, closed sets, Neighborhoods, first and second countable paces.

UNIT II: Complete metric space, Cantor's intersection theorem, Baire category theorem, completeness and contracting mappings, Banch fixed point theorem and its application, completion of a metric space, Isometric, Completion theorem.

UNIT III: Topological spaces: Definition and basic concepts. Continuous function and Homomorphism of metric spaces and topological spaces, Urysohn's metrization the orem.

UNIT IV: Separability, count ability axims, separable spaces, product spaces, Quotient spaces, eparation axioms, Urysohn's lemma, Tietze extension theorem.

UNIT V: Compactness and local compactness, sequentially compactness and totally boundedness, connectedness and local connectedness. One point compactification of local compact Hausdorff spaces.

References:

1. Simmons G.F.: Introduction to Topology and Modern Analysis Mc-Graw Hill Book Co., N.Y. (1963)
2. Copson E.T.: Metric Spaces
3. P.K.Jain & K. Ahmed : Metric Spaces
    a. New Age International (P) Ltd., New Delhi (1995) (Reprint 1997) &
    b. John Wiley & Sons, New York (1995)
4. James R. Munkres: Topology Prentice Hall of India

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – I

COMPLEX ANALYSIS

Sub. Code: MSCM/Y/12O **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Geometric representation of complex numbers. Stereographic projections. Analytic function, Cauchy-Riemann equations, Harmonic functions, Elementary functions.

UNIT II: Mobius transformation, Isogonal and conformal transformations, Geometrical inversion. The critical point, co-axial circles. Invariance of the cross-ratio, special Mobius transformation:$w = z^n$, $w = \sqrt{z}$, $w = tan^2 \{(1/4\ \pi)\ \sqrt{z}\}$, $z = c\ sin\ w$.

UNIT III: Complex integration, Cauchy's theorem and integral formula, Poisson's integral formula, Derivatives of an analytic function, Taylor's theorem, Morera's theorem, Liouville's theorem, Laurent's theorem.

UNIT IV: Zeros and singularities, Poles and Zeroes of Mermorphic functions, Rouche's theorem, The maximum modulus principle, Fundamental theorem. Theory of Residues, Analytical continuation.

UNIT V: Entire functions-Mittag Leffler's theorem, The Weierstrass factorization theorem, The Jenson and Poisson-Jenson formulas, Hadmard's factorization theorem.

References:

1. Churchil & Brown: Complex Analysis, John Wiley & Sons Inc
2. J.B.Conway: Functions of One Complex Variable, Springer-Verlag, New York, 1973
3. H.A.Priestly: Introduction to Complex Analysis, Clarendo Press, Oxford, 1990
4. L.V.Ahlfors: Complex Analysis, 2nd Edition Mc-Graw Hill Co., New York, 1965

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – I

DIFFERENTIAL EQUATIONS

Sub. Code: MSCM/Y/13O **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Total Differential Equations, Series solutions of first and second order linear equations, Integration in series.

UNIT II: The method of successive approximations, Picard's existence theorem, Existence and uniqueness of the solution of the equation $y' = f(x,y)$. Lipschitz condition. Linear dependence and independence of solutions of linear differential equations. Wronskian.

UNIT III: Partial differential equations of the first order, Cauchy's problem for first order equation. Non-linear partial differential equation of first order, Charpit's method, Jacobi's method, Monge's method: Linear partial differential equations with constant coefficients, Equations with variable coefficient, Linear equations of the second order.

UNIT IV: Two and three dimensional Lap lace, Wave and Diffusion equations, Solution of the boundary value problems by the method of separation of variable.

UNIT V: Linear difference equations with constant coefficient, Generating function technique, Matrix methods.

References:

1. I.N.Sneedon : Elements of Partial Differential Equations
   Mc-Graw Hill Book Company Inc., New York
2. S.Goldberg : Difference Equations, John Wiley & Sons Inc.

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – I

DYNAMICS

Sub. Code: MSCM/Y/14O **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Lagrangian and Eulerian methods, Equation of continuity in fluid motion, Boundary surface, Euler's equation of motion for perfect fluid, Bernoulli's theorem.

UNIT II: Two dimensional motion, Irrotational flows, Complex potential for various singularities, Images. Application of conformal mapping. Motion of a circular cylinder, Blasius's theorem.

UNIT III: General motion of a fluid element, Stoke's theorem, Kelvin's circulation theorem, Kelvin's minimum energy theorem. Motion of a sphere in an infinite mass of liquid at rest at infinity, Ideal fluid flow around a sphere, concentric sphere (initial motion).

UNIT IV: Stress-strain analysis, Constitutive equation, Navier-stokes equations, Buckingham's II- theorem, similitude, Non-dimensional parameters: Froude number, Pressure coefficient, Reynolds number, Grashof number, Prandtl number, Peclet number.

UNIT V : Exact solutions : Laminar flow between parallel plates, Hagen-Poiseuille flow through a circular pipe (co-axial circular pipes, elliptic cross section, equilateral triangular section) Laminar flow between concentric rotating cylinders, steady motion of a various fluid due to a slowly rotating sphere, Flow in convergent and divergent channels, unsteady motion of flat plate, flow due to an oscillating flat plate, unsteady flow of viscous incompressible fluid between two parallel plates, Low Reynolds number solution : Flow past a sphere and circular cylinder.

References:

1. F. Chorlton : Fluid Dynamics Van Nostrand Com.Ltd.
2. Principles of Fluid Dynamics : M. K. Natrajan oxfords & IBH Publishing Co.
3. Hydrodynamics : H. Lamb Cambridge University Press
4. Hydrodynamics Vol.I & II : Basset A. B. over Publishing Inc.

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – II

ABSTRACT ALGEBRA

Sub. Code: MSCM/Y/210 **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Commutative rings, sub-rings, ideals. Prime ideals and maximal ideals.

UNIT II: Primary decompositions, Rings of fractions. Commutative Noetherian rings.

UNIT III: Modules. Chain conditions on modules.

UNIT IV: Characteristic of a field, perfect fields, reparability of extensions, normal extensions.

UNIT V: Finite fields, primitive elements, algebraically closed fields, norms and traces.

References:

1. R.Y.Sharp : Steps in Commutative Algebra, Cambridge University Press, 1990.
2. P.J.McCarthy : Algebraic Extension of Fields, Chelsea Publishing Company, New York, 1976.

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – II

LINEAR ALGEBRA

Sub. Code: MSCM/Y/220 **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Vector spaces, Subspaces, Bases, Dimension and coordinates of a vector space.

UNIT II: The algebra of linear transformations, Isomorphism. Representation of transformations by matrices, Linear functional, Annihilators, the transpose of a linear transformation.

UNIT III: Invariant, Direct cum decomposition, Characteristics values and Characteristics vectors, Diagonalizable operators, The primary decomposition theorem.

UNIT IV: Inner product spaces, Linear functional and adjoints, Positive unitary and normal operators. The spectral theorem, Simultaneous diagonalization of normal operators.

UNIT V: Bilinear forms, Symmetric bilinear forms, Skew Symmetric bilinear forms.

References:

1. K.Hoffman & R.Kunje: Linear Algebra (Ch 2, 3, 6 and 9), Prentice Hall of India.
2. P.R.Halmos : Finite Dimensional Vector Spaces

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – II

OPERATIONS RESEARCH

Sub. Code: MSCM/Y/230 **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Inventory: Inventory models, Probabilistic models, Inventory models with price breaks. Replacement: Replacement of items that deteriorate problems of choosing between two machines, Replacement of items that fail completely, Problems in mortality and staffing.

UNIT II: Waiting Lines: Queuing models property of Poisson, exponential and Erlangian processes, Steady state solution of queuing models: M/M/1. General single station queuing model M/M/S and M/E_k/1, simple numerical problems on these models. Sequencing: Definition, Processing n jobs through two and three machines. 2 jobs through n machines (graphical method). The Traveling Salesman problem.

UNIT III: Allocation: Simplex, Assignment and Transportation problems of linear Programming. Computational methods of obtaining their optimal solution. Degeneracy in transportation problems.

UNIT IV: Theory of Games: Competitive strategies, competitive games, pure and mixed strategies, Rectangular games, Minimax criterion of optimality. Methods for solution of rectangular games and linear programming problem. Minimax theorem, Graphical method.

UNIT V: Dynamic Programming: Concept of dynamic programming. Problems with a finite number of consecutive decisions, relations between linear programming and dynamic programming. Mathematical formulation of dynamic programming. CPM/PERT techniques.

References:

1. H. A. Taha : Operations Research (An Introduction)Prentice Hall of India
2. Sasieni, Yaspan, Friedman : Operations Research John Wiley & Sons Inc.

SYLLABUS
MASTER OF SCIENCE – MATH
YEAR – II

COMPUTATIONAL NUMERICAL METHODS

Sub. Code: MSCM/Y/240 **Credits: 02**

Total Marks: 100 **Minimum Pass Marks: 40%**

Internal Assessment: 40 Marks **University Examination: 60 Marks**

UNIT I: Computer Arithmetic, Concept of truncation error, Round off error, Error propagation of numerical stability. Curve fitting and principle of least square.

UNIT II: Solution Of equation, Bisection, Iteration Method, Regula falsi & Newton Rephson method, The Comlex Root. Polynomial Interpolation, Difference Schemes, Newton & Hermite Formalae of Interpolation. Inter Polation Using Differences,

UNIT III: Runge-kutta, Eulars Picards Method, Milen's Method, Solution By Taylors Series, Linear Equation, Gauss Elimination Method, LU- Decomposition, Jordan's & Court's Method

UNIT IV: Jacobi Method, Gauss-Sidal Method, Relaxation Method, Continuous frequency distribution, Graphical Representation, Regression & Regression Analysis.

UNIT V: Single step and Multi-step method of numerical solution of differential equations, Criterion of stability and consistency, convergence of a numerical method, Numerical solutions of Elliptic, Parabolic and Hyperbolic equations by finite difference technique. Time Series & Test Of Significance, Student't' Test, Chi- Square test, F-test, Variance Analysis. Numerical Quadrate & error Estimation, Newton-Cote Formulae, Boole's Rule, Euler-Maclaurian Rules

References:

1. M.K.Jain: Numerical Methods for Scientific and Engineering Computation. S.R.K. Iyengar, R.K. JainWiley Eastern Ltd.
2. C.E.Froberg: Introduction to Numerical Analysis Addison – Wesley Pub. Company
3. S.S. Sastry: Introductory method to Numerical Analysis. Prentice Hall of India

4. Numerical & Statistical Pundhir, Singh & Pundhir, Techniques Pragati Prakashan Merrut.
5. Numerical & Statistical Pundhir, Singh & Pundhir, Techniques Pragati Prakashan Merrut.