

M.A/M.Sc. Mathematics Course Structure (Revised)
(With effect from the academic year 2015-16 onwards)

Semester – I

Core Course

Paper- I ó	Discrete Structures	SOS/Math/ C001
Paper -II ó	Abstract Algebra- I	SOS/Math/C002
Paper- III ó	Mechanics	SOS/Math/C003
Paper- IV ó	Complex Analysis	SOS/Math/C004
Paper -V ó	Operations Research -I	SOS/Math/C005
Paper -VI-	Practical/Viva-Voce	SOS/Math/C006

Semester- II

Core Course

Paper- VII	Abstract Algebra- II	SOS/Math/C007
Paper- VIII	Fluid Dynamics	SOS/Math/C008
Paper- IX	Operations Research- II	SOS/Math/C009
Paper- X	Graph Theory	SOS/Math/C0010
Paper- XI	Topology- I	SOS/Math/C0011
Paper -XII	Practical/Viva- Voce	SOS/Math/C0012

Semester- III

Core Course

Paper- XIII	Topology- II	SOS/Math/C0013
Paper -XIV	Measure and Integration -1	SOS/Math/C0014

Elective Course

Paper- XV	Differential Geometry	SOS/Math/E001
Paper- XVI	Fluid Mechanics	SOS/Math/E002
Paper- XVII	Calculus of Variation	SOS/Math/E003
Paper- XVIII	Computer Fundamentals and Data Structures	SOS/Math/E004
Paper- XIX	Algebraic Coding Theory	SOS/Math/E005

Self- Study Course

Paper -XX Any one of the following:

- | | |
|--|------------------|
| (a) Mathematical Methods | SOS/Math/E006(a) |
| (b) Tensor Analysis and Special Theory of Relativity | SOS/Math/E006(b) |
| (c) Financial Mathematics | SOS/Math/E006(c) |

Core Course

Paper- XXI Viva-Voce SOS/Math/C0015

Semester -IV

Core Course

Paper- XXII Measure and Integration-II SOS/Math/C0016

Paper -XXIII Functional Analysis SOS/Math/C0017

Elective Course

Paper- XXIV Integral Equations and Boundary Value Problems SOS/Math/E007

Paper- XXV Biomechanics SOS/Math/E008

Paper- XXVI Fuzzy Set Theory SOS/Math/E009

Paper- XXVII Mathematical Modeling SOS/Math/E0010

Paper- XXVIII Theory of Numbers SOS/Math/E0011

Core Course

Paper- XXIX Viva-Voce SOS/Math/C0018

Note:

- 1- In Semester- I, all Papers are compulsory.
- 2- In Semester- II, all Papers are compulsory.
- 3- In Semester- III , Papers - XIII, XIV & XXI (Three Papers) are compulsory and choose any Three Papers out of Elective Papers-XV, XVI, XVII, XVIII & XIX.
- 4- In Semester-IV, Papers -XXII, XXIII & XXIX (Three Papers)are compulsory and choose any Three Papers out of Elective Papers- XXIV, XXV, XXVI, XXVII & XXVIII.
- 5- Each paper carries 100 Marks, which includes two sessional tests (each of 20 Marks) and a main Examination of 60 Marks.

SEMESTER – I

PAPER- I DESCRETE STRUCTURES

SOS/Math/C001

- I. Recurrence relations, Linear homogeneous recurrence relations, Non-homogeneous recurrence relations, Solutions of recurrence relations.
- II. Partially ordered sets, Different type of lattices, Sub-lattices, Direct product, Ideal lattice, Modular and distributive lattices.
- III. Boolean algebra, Ideals in Boolean algebra, Boolean rings, Boolean functions, Karnaugh maps, Application of Boolean algebra to switching theory.
- IV. Graphs, Direct graphs, Undirected graphs, Relations and graphs, Path and circuits, Eulerian and Hamiltonian graphs, Planner graphs, Connected graphs.

TEXT BOOKS

- | | |
|-------------------------------------|------------------|
| 1. Discrete Mathematics : | Khanna & Bhambri |
| 2. Element of Discrete Mathematics: | C. I Liu |
| 3. Discrete Mathematics: | G.S. Rao |
| 4. Lattice Thoery: | V.K. Khanna |
| 5. Discrete Mathematics: | R. Johnsonbaugh |

PAPER-II

ABSTRACT ALGEBRA- I

SOS/ Math/C002

- I. Class equation and conjugacy classes, Cauchy's theorem for finite abelian and non-abelian groups, Sylow's theorems.
- II. The normal series and composition series, Jordon-Holder theorem, Solvable groups, External and internal direct products.
- III. Ideals, Principal ideals, Quotient rings, Field of quotients, Embedding of rings, fundamental theorem on homomorphism and isomorphism.
- IV. Prime and maximal ideals, Ring of polynomials, Factorization of polynomials over a field, Factorization theorem in integral domain.

TEXT BOOKS

- | | |
|---|------------------------------------|
| 1. Contemporary Abstract Algebra : | Josheph A Gallian |
| 2. A First course in Abstract Algebra : | John. B. Fraleigh |
| 3. Modern Algebra : | Surject Singh and Quazi Jameerudin |
| 4. Topics in Algebra : | I. N. Herstein |

PAPER –III**MECHANICS****SOS/ Math/C003**

- I. Conservation of linear and angular momentum under finite and impulsive forces, Conservation of energy.
- II. Generalized coordinates, Lagrange's equations of motion, Small oscillations.
- III. Hamiltonian's canonical equations, Hamilton's principle and principle of least action.
- IV. Euler's equations of motion, Kinetic energy, Eulerian angles, Instantaneous axis of rotation.

TEXT BOOKS

1. Dynamics- Part II: A.S. Ramsey
2. Classic mechanics : H. Goldstein
3. Classical Mechanics: N.C. Rana and P.S. Juag
4. Dynamics of Rigid Body : Ray and Sharma
5. Dynamics of Rigid body : S.L. Loney

PAPER-IV**COMPLEX ANALYSIS****SOS/ Math/C004**

- I. Complex Integration, Expansion of an angle function as power series, Taylors and Laurents series, Residue and Poles, Singularities, Classification of Isolated singularities, Cauchy residue theorem.
- II. Application of Residue theorem in evaluation of improper real integers and evaluation of sum.
- III. Conformal mapping properties, Mobius transformation, Elementary examples.
- IV. Maximum modulus theorem, Mittag-Leffler theorem, Weirstrass factorization theorem, Jensen's formula, Poisson- Jensen formula, Hadmard, three circle theorem, Analytic Continuation.

TEXT BOOKS

1. Real and Complex Analysis : W. Rudin
2. Complex Analysis : J.B. Convey
3. Complex Analysis : B. Chaudhary
4. Complex Analysis : E.C. Tichmarch
5. Foundation of Complex Analysis : S. Ponnusomy

PAPER –V**OPERATIONS RESEARCH –I****SOS/ Math/C005**

- I. An introduction to operations research, Methodology of O.R. Features of O.R. Problems, Different models in O.R., Opportunities and shortcomings of O.R. approach.
- II. Dual simplex method, Revised simplex method, Sensitivity analysis.
- III. Assignment and transportation problems.
- IV. Theory of games, Integer linear programming.

TEXT BOOKS

1. Operations Research : Kanti Swarup, P.K. Gupta & Man Mohan
2. Operations Research: Theory and Applications : J.K. Sharma
3. Operations Research : H.A. Taha
4. Operations Research : R. Bronson

PAPER-VI**PRACTICAL/ VIVA-VOCE****SOS/ Math/C006**

Based on Paper-I to Paper- V

SEMESTER-II**PAPER-VII****ABSTRACT ALGEBRA-II****SOS/ Math/C007**

- I. Introduction to fields extensions, Finite fields, Algebraic extensions, Simple field Extension, Roots of polynomials.
- II. Splitting fields, Separable and inseparable extensions, Perfect field.
- III. Automorphisms of fields, Fixed fields, Galois theory, Illustrations of Galois theory.
- IV. Radical extension and solvability, Constructible numbers, The impossibility of certain constructions.

TEXT BOOKS

1. Contemporary Abstract algebra : Josheph A. Gallian
2. A first course in Abstract Algebra : John B. Fraleigh
3. Modern Algebra : Surjeet Singh and Quazi Zameerudin
4. Topics in Algebra : I. N. Herstein

PAPER-VIII**FLUID DYNAMICS****SOS/ Math/C008**

- I. Kinematics of fluids, Lagrangian and Eulerian methods, Local and individual time rates of change, Equation of continuity, Boundary surface.
- II. Equation of motion of inviscid fluids, Euler's equation of motion, Bernoulli's equation, Lagrange's equation, Conservative field of force, Cauchy's Integral, Helmholtz's equation.
- III. Impulsive motion of a fluid, Energy equation of inviscid fluid, General theory of irrotational motion, Connectivity, Flow and circulation, Kelvin's circulation theorem, Stoke's theorem, Permanence of irrotational motions, Green's theorem, Kinetic energy of finite and infinite liquid, Kelvin's minimum energy theorem, Mean value of the velocity potential over a spherical surface.
- IV. Motion in two dimensions, Stream function, Complex potential, Source, Sink, Doublet, Complex potential and images with respect to straight line and circle, Milne-Circle theorem, Blasius theorem.

TEXT BOOKS

1. Foundation to Fluid Mechanics : S.W. Yuan
2. Text book of Fluid Dynamics : F. Chorlton
3. Theoretical Hydro-Dynamics : Bansi Lal
4. A text book of Fluid Dynamics : M. Ray & Sharma

PAPER-IX OPERATIONS RESEARCH-II**SOS/ Math/C009**

- I. Inventory control, Deterministic Economic order quantity(EOQ) models.
- II. Queueing theory, Symbols and notations, Classification of queue, M/M/I queueing models.
- III. Markov chain, Project Scheduling by PERT/CPM.
- IV. Dynamic programming, Non-linear programming, Kuhn-Tucker conditions, Wolfe's modified simplex method.

TEXT BOOKS

1. Operations Research : Kanti Swarup, P.K. Gupta & Man Mohan
2. Operations Research, Theory and Applications : J.K. Sharma
3. Operations Research : H.A. Taha
4. Operations Research : R. Bronson

PAPER-X**GRAPH THEORY****SOS/ Math/C0010**

- I. Trees and fundamental circuit, Distance and centers, Binary Trees, Binary search, Spanning trees, Primes and Kuratowski, Dijkstra's Algorithm, Fundamental circuits, Spanning trees in a weighted graphs and dual graphs.
- II. Matrix Representation of Graphs: Incidence matrix, Submatrix of $A(G)$, Circuit matrix, Fundamental circuit matrix and rank of B , Cut sets matrix, Path matrix and adjacency matrix.
- III. Chromatic number and chromatic polynomials, Matchings, Coverings, Chromatic partitioning.
- IV. Directed graphs, Digraph and Binary relations, Euler's digraph, Directed path & connectedness, Acyclic digraphs.

TEXT BOOKS

1. Basic Graph Theory : Parthswarthy
2. Graph Theory : N. Deo
3. Graph Theory and Application : C. Vashudev
4. Graph Theory : F. Harary

PAPER-XI**TOPOLOGY-I****SOS/ Math/C0011**

- I. Metric spaces, Open sets, Closed sets, Closure, Interior, Exterior, Dense and non-dense sets, Sequence and subsequence in metric space, Complete metric spaces, Cantor's intersection theorem, Baire's category theorem.
- II. Definition and example of topological spaces, Closed sets, Closure, Dense subsets, Neighbourhood, Interior and boundary, Accumulation points and derived sets, Base and sub bases, Subspace and relative topology, Kuratowski closure operator and neighbourhood system.
- III. Continuity and homeomorphism.
- IV. Connectedness, Connected and disconnected sets, Local connectedness, Component and path components, Continuity and connectedness, Totally disconnected space.

TEXT BOOKS

1. Topology : A First Course : James R. Munkres
2. General Topology : J. L. Kelly
3. Topology and Modern Analysis : G.F. Simmons
4. General Topology : Seymour Lipschutz

PAPER-XII

PRACTICAL/VIVA-VOCE

SOS/ Math/C0012

Based on Paper óVII to Paper- XI

SEMESTER-III

PAPER-XIII

TOPOLOGY- II

SOS/ Math/C0013

- I. Compact spaces, Sequentially compact spaces, Local compactness, Ccontinuity and compactness.
- II. First and second countable spaces, Separabilty and Lindlof of property.
- III. T_1 spaces, Hausdorff spaces, Regular spaces, Normal space, completely normal spaces.
- IV. Urysohn's lemma, Product spaces, Nets and filters.

TEXT BOOKS

1. Topology: A First Course : James R. Munkres
2. General Topology : J.L. Kelly
3. Topology and Modern Analysis : G.F. Simmons
4. General Topology : Seymour Lipschutz

PAPER –XIV

MEASURE AND INTEGRATION-I

SOS/ Math/C0014

- I. Denumerable sets, Uncountable sets, Cardinal numbers.
- II. Lebesgue measure, Measurable sets, Borel sets, Cantor's ternary sets and their properties.
- III. Measurable functions, set of measure zero, The structure of measurable functions.
- IV. Lebesgue Integrals and their properties, Lebesgue integrals for unbounded functions, General Lebesgue integrals.

TEXT BOOKS

1. Real Analysis : H.L. Royden
2. An Introduction to Measure and Integration : Inder K. Rana
3. Lebesgue Measure and Integration : P.K. Jain and V.P. Gupta
4. Measure Theory and Integration : G. De. Barra

PAPER- XV**DIFFERENTIAL GEOMETRY****SOS/ Math/ E001**

- I. Curves in space; Arc length, Order of contact, Tangent, Normal, Binormal, Osculating, Plane, Serret-Frenet formulae, Curvature and torsion. Osculating circle and osculating sphere, Helix, Bertrand curves.
- II. Behaviour of a curve in the neighbourhood of a point. Concept of a surface, Envelope and developable surface, Parametric curves, Family of the surfaces, Edge of regression, Ruled surfaces, Central points.
- III. Fundamental forms and curvature of surfaces: First fundamental form. Second fundamental form of the surfaces of revolution, Weingarten's equation, Direction coefficients, Family of curves.
- IV. Local non-intrinsic properties of a surface Normal curvature, Principal directions, Principal curvatures, Minimal surface, Lines of curvature. Rodrigues and Monge's theorem, Euler's theorem, Joachimsthal's theorem, Dupin's indicatrix, Third fundamental form.

TEXT BOOKS

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|--|----------------------------|
| 1. Differential Geometry : | T.J. Willmore |
| 2. Differential Geometry of Three Dimensions : | C.E. Weatherburn |
| 3. Elements of Differential Geometry : | R.S. Millman & G.D. Parket |
| 4. Introduction to Differential Geometry : | A. Goetz |

PAPER-XVI**FLUID MECHANICS****SOS/ Math/E002**

- I. Motion of the cylindrical and elliptic Cylinders.
- II. Motion of Sphere, Motion of a sphere in an infinite mass of the liquid at rest at infinity. Liquid streaming past a fixed sphere, Equation of motion of a sphere, Pressure distribution.
- III. General theory of stresses and rate of strains, Newton's law of viscosity, State of stress, Principal stresses and principal directions, Transformations of two and three stresses components and rate of strain components, Relation between stresses and rate of strain components.
- IV. Navier-Stokes equations of motion; Energy equation for viscous fluid, Energy dissipation due to viscosity.

TEXT BOOKS

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| 1. Foundation to Fluid Mechanics : | W.Yuan |
| 2. Text book of Fluid Dynamics : | F. Chorlton |
| 3. An Introduction to Fluid Mechanics: | G.K. Batchlor |
| 4. Fluid Dynamics : | M.D. Raisinghanian |

PAPER-XVII**CALCULUS OF VARIATION****SOS/ Math/E003**

- I. Variation of function: Necessary condition for an extremum. Euler's equation, Fixed end point problem for unknown functions. Variational problems in parametric form. Functional depending on higher order derivatives and variational problems with subsidiary condition.
- II. The isoperimetric problem, Invariance of Euler's equation under coordinate transformation, General variational of functional, Variable end point problems. Transversality condition transversal theorem, Weierstrass-Endmann corner condition.
- III. Cononical form of Euler equations and their first integrals. Cononical transformation, Noether's theorem, The principle of least action, Conservation law, Hamilton Jacobi's equations, Jacobi's theorem.
- IV. The second variation of a functional and the formula for second variation, Legendre's necessary condition. Jacobi's necessary condition, Conjugate point, Sufficient condition for a weak extremum.

TEXT BOOKS

1. Calculus of Variation: Gelfrand and Fomin
2. Calculus of Variation : Elsgolt
3. Calculus of Variation : A.S.Gupta

PAPER-XVIII**COMPUTER FUNDAMENTALS AND DATA STRUCTURES****SOS/ Math/E004**

- I. History and classification of computers, fundamentals of computer system: Data types, number system, complements; Floating point representation, normalized floating point representation, fixed point represented arithmetic computations.
- II. Truth tables, Boolean algebra, De-Morgan's theorem, Logical gates, logic diagram, logical expressions/functions, Karnaugh maps, sum of product and product of sum, combinational circuits and integrated circuits.
- III. Introduction to data structures, Arrays, Stack and queues, Linked lists, Singly and doubly linked lists, Binary trees, Operations on binary trees and applications.
- IV. Sorting, searching, algorithms and graphs.

TEXT BOOKS

1. Fundamental of Computers, PHT, India : V. Raja Raman.
2. Introduction to computers, Mc-Graw-Hill : P. Norton
3. Data structures, Algorithms and Application in C++, Univerties Press : S. Sahni
4. Data Structures with C (Schaum's series) Tata Mc-Graw-Hill : S. Lipschutz

PAPER- XIX**ALGEBRAIC CODING THEORY****SOS/ Math/E005**

- I. The communication channel, The coding problem, Types of Codes, Block Codes, Error-Detecting and Error-Correcting Codes, Linear Codes, The Hamming Metric, Description of linear block codes by matrices, Dual codes, Standard Array, Syndrome, Step-by-step Decoding Modular representation.
- II. Error-correction, Capabilities of linear codes, Bounds on minimum distance for block codes, Plotkin bound, Hamming sphere packing bound, Varshamov-Gilbert-Sacks bound, Bounds for Burst-Error Detecting and correcting codes, Important linear block codes.
- III. Hamming codes, Golay codes, Perfect codes, Quasi-perfect codes, Reed-Muller codes, Codes derived from Hadamard matrices, Product codes, Concatenated codes.
- IV. Tree codes, Convolutional codes, Description of linear tree and convolutional codes by matrices, Standard array, Bounds on minimum distance for convolutional codes, V-G-S bound, Bounds for Burst-Error detecting and correcting convolutional codes.

TEXT BOOKS

1. A First Course in Coding Theory: Raymond Hill
2. Error Correcting Coding Theory : Man Young Rhee
3. Error-Correcting Codes: W.W. Peterson and E.J. Weldon, Jr.
4. Algebraic Coding Theory : E.R. Berlekamp

PAPER -XX**SELF-STUDY: Any one of the following:****Paper -XX (a)****MATHEMATICAL METHODS****SOS/Math/E006 (a)**

- I Legendre Polynomial
- II Bessel's polynomial
- III Hermite polynomial
- IV Laguerre polynomial

TEXT BOOKS

1. The Special Functions and their Applications: Y.L.Luke, Academic Press
2. Special Functions: G.E. Andrews, England Cambridge, University Press, 1999.
3. Special Functions of Mathematical Physics: Springer Verlag 1966

PAPER- XX (b) TENSOR ANALYSIS AND SPECIAL THEORY OF RELATIVITY

SOS/ Math/E006 (b)

I Invariance ó Transformations of coordinates and its properties, Transformation by invariance, Transformations by covariance and contravariance, Tensor and their laws of transformations, Algebras of tensors- Quotient Tensors, Symmetric and skew symmetric tensors, Relative tensors.

II. Metric Tensor, The fundamental and associated tensors, Christoffel's symbols, Transformations of Christoffel's symbols, Covariant differentiation of tensors, Formulas for covariant differentiation, Ricci theorem, Riemann- Christoffel tensor and their properties.

III. Einstein tensor, Riemannian and Euclidean Spaces (Existence Theorem), The e-systems and the generalized Kronecker deltas, Application of the e-systems.

IV. Special theory of relativity, Galilean transformation, Maxwell's equations, The ether theory, The principle of relativity, Relativistic kinematics, Lorentz transformation equations, Events and simultaneity, Example of Einstein strain, Time dilation, Longitudinal Contraction, Invariant Interval, Proper time and proper distance, World line, Example of twin paradox , Addition of velocities, Relativistic Doppler's effect.

TEXT BOOKS

1. I.S. Sokolnikoff, Tensor Analysis, John Wiley and Sons, New York, 1964
2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985
3. Tensor Calculus, Toronto, 1949 : J.L. Synge and A. Schild
4. The Mathematical Theory of Relativity, Cambridge University Press, 1930 : A.S. Eddington.
5. An Introduction to Theory of Relativity, New York, 1942 : P.G. Bergman

PAPER- XX (c)

FINANCIAL MATHEMATIS

SOS/Math/E006 (c)

- I. Single period model, Definitions of finance- pricing, Forward- one- step binary model, Ternary model- Characterization of no arbitrage, Risk-neutral probability measure
- II. Bi normal trees and discrete parameter martingales, Multi-period binary model, American options, Discrete parameter martingales and Markov processes, Martingale theorems, Binomial representation theorem overturn to continuous models
- III. Brownian motion, Definition of the process, Levy's construction of brownian motion, The reflection principle and scaling, Martingales, Continuous time.

IV Stochastic calculus, Non-differentiability of stock prices, Stochastic integration, Ito's formula, Integration by parts and stochastic, Fubini theorem, Girsanov theorem, Brownian martingale representation theorem, Geometric brownian motion, The Feynman- Kac representation.

TEXT BOOKS

1. Alison Etheridge A Course in Financial Calculus, Cambridge University Press, Cambridge, 2002
2. Martin Baxter and Andrew Rennie, Financial Calculus: An Introduction to Derivatives Pricing. Cambridge University Press, Cambridge, 1996.
3. Damien Lambertson and Bernard Lapeyre, (Translated by Nicolas Rabeau and Francois Mantion).
4. Introduction to Stochastic Calculus Applied to Finance, Chapman and Hall, 1996.
5. Marek Musiela and Marek Rutowski, Martingale Methods in Financial Modeling, Springer Verlag, New York, 1988.

PAPER-XXI

VIVA-VOCE

SOS/Math/C0015

SEMESTER –IV

PAPER-XXII

MEASURE AND INTEGRATION-II

SOS/Math/C0016

- I. Convergence in Measure, Egoroff's Theorem, Fatou's Lemma, Convergence Theorems.
- II. Dini derivatives, Differentiation of monotone functions, Functions of bounded variations, Differentiation of an integral, Absolute continuous functions, Integral of the derivative.
- III. L^p -spaces, Properties of L^p - spaces, Holder's and Minkowski's Inequalities.
- IV. Signed measure, Hahn-Decomposition theorem, Radon-Nikodym theorem, Product measure.

TEXT BOOKS

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|---------------------------------------|--------------------------|
| 1. Real Analysis : | H.L. Royden |
| 2. Measure and Integration : | S.K. Berberian |
| 3. Lebesgue Measure and Integration : | P.K. Jain and V.P. Gupta |
| 4. Measure Theory and Integration : | G. De. Barra. |

PAPER- XXIII**FUNCTIONAL ANALYSIS****SOS/Math/C0017**

- I. Normed linear spaces, Banach spaces, Subspaces, Quotient Spaces, Equivalent, Norms.
- II. Bounded linear Transformation/operators, Hahn Banach Theorem, Open mapping, Theorem, Closed Graph Theorem Uniform Boundedness Principle.
- III. Inner Product spaces, Hilbert Spaces, Orthogonality of vectors, Orthogonal complements and projection Theorem, Riesz Representation Theorem, Orthonormal Sets.
- IV. Operators on Hilbert Spaces, Self-Adjoint, Normal and unitary operators, Orthogonal projection operators.

TEXT BOOKS

1. Functional Analysis : P.K. Jain, O.P. Ahuza and Khalil Ahamad
2. Topology and Modren Analysis : G.F. Simmons
3. Introductory functional Analysis with Applications : E. Kreyszig
4. Functional Analysis : B.V. Limaye

PAPER-XXIV**LINEAR INTEGRAL EQUATIONS & BOUNDARY VALUE****PROBLEMS****SOS/Math/E007**

- I. Classification of integral equations, Relation between Differential and Integral equations, Green's function.
- II. Solution of Fredholm integral equations, Solution of Volterra integral equations.
- III. Hilbert-Schmidt theory and classical theory of Fredholm., Singular integral equation and numerical solution of integral equations.
- IV. Perturbation techniques and its applications to mixed boundary value problems, Two-part and three-part boundary value problems, Solutions of electrostatic problems involving a charged circular disk and annular circular disk, A spherical cap, an annular spherical cap in a free space or a bounded space.

TEXT BOOKS

1. Integral Equations : Hilderbrand
2. Linear Integral Equations : V. Lovit
3. Linear Integral Equations : R.P. Kanwal
4. Integral Equations : Li. G. Chambers

PAPER- XXV**BIOMECHANICS****SOS/Math/E008**

- I. Biomechanics, Method of approach, Tools of investigation, Stresses and rates of strain, Constitutive equations, Newtonian viscous fluid, Hookean elastic solids, Biological transport process, Basic momentum, heat and mass transport concepts.
- II. Conservation laws, mass conservation, Momentum conservation, Energy conservation.
- III. Bio-fluid dynamics concept, Transport phenomena and the cardiovascular system.
- IV. Bio-fluid mechanics of organ systems, The lungs, the kidneys and the liver.

TEXT BOOKS

1. Biomechanics, Springer-verlag : Y.C. Fung
2. Biofluid Dynamics Taylor and Francis : Clement Kluinstreuer
3. Frontier in Mathematical Biology: S.A. Levin
4. BioMathematics: Ricciardi

PAPER- XXVI**FUZZY SET THEORY****SOS/Math/E009**

- I. Fuzzy sets, Basic definitions, Alpha-cut sets, Convex fuzzy sets, Basic operation on fuzzy sets, Types of fuzzy sets, Cartesian products, Algebraic products, Bounded sum and differences, t-norms and t-corners.
- II. The extension principle, The Zadeh's extension principle, Images and inverse image of fuzzy sets, Fuzzy numbers, element of fuzzy arithmetic.
- III. Fuzzy relation and fuzzy graphs. Fuzzy relation on fuzzy sets, composition of fuzzy relation, min-max composition and properties, equivalence relations, fuzzy compatibility relation.
- IV. Fuzzy logic, An overview of classical logic, Multivalued logic, Fuzzy propositions, Fuzzy qualifiers, Linguistic variables and hedge.

TEXT BOOKS

1. Fuzzy sets and Fuzzy logic: G.L. Klir and Yuan
2. Fuzzy set theory and its Applications : H.J. Zimmermann
3. Fuzzy set theory, Fuzzy logic and their Applications: A.K. Bhargava
4. First Course on Fuzzy Theory and Applications Kwang H. Lee

PAPER- XXVII**MATHEMATICAL MODELING****SOS/Math/E0010**

- I Mathematical Modeling through ordinary differential equations of first order, Linear growth and decay models, Non-linear growth and decay models, Compartment models-dynamics problem, Geometrical problems.
- II Mathematical Modeling through systems of ordinary differential equations of first order, Population dynamics, epidemics-compartment models, Economics, Medicine, Arm-race, Battles and international trade- dynamics.
- III Mathematical modeling through ordinary differential equations of second order, Planetary motions, Circular motion, Motion of satellites, Mathematical modeling through linear differential equations of second order, Miscellaneous mathematical models.
- IV Mathematical modeling through difference equations, Simple models, Basic theory of linear difference equations with constant coefficients, Economics and finance-population- dynamics and genetics- probability theory.

TEXT BOOKS

1. Mathematical Modeling: J.N. Kapur
2. Mathematical Models in Biology and Medicine: J. N. Kapur.
3. Mathematical Modeling: Dick Clements
4. The Nature of Mathematical Modeling : Neil Gershenfeld

PAPER- XXVIII**THEORY OF NUMBERS****SOS/MATH/E0011**

- I Well ordering principle, Division algorithm, Euclidean algorithm, Fundamental theorem of arithmetic , Euclid's lemma,
- II. Congruences, Residue classes, Linear congruences, Euler's phi-function, Tau-function, Euler's theorem, Fermat's theorem, Wilson's theorem.
- III. Quadratic congruences, Legendre symbol, Continued fraction, Finite and infinite continued fraction.
- IV. Diophantine equation, Simultaneous linear Diophantine Equations, Sums of squares, Pell's equations.

TEXT BOOKS

1. Elementary Number Theory : David M. Burton
2. Theory of Numbers : George Andrews

3. Elementary Number Theory with Applications :
4. Fundamental of Number Theory:

Thomas Koshy
William J. Lereque

PAPER- XXIX

VIVA-VOCE

SOS/MATH/C0018