R.K.D.F. UNIVERSITY, RANCHI

M.Sc.(Mathematics)

SYLLABUS
SEMESTER-1

S.No.	Subject Code	Subject Name	Marks Distribution				
			Internal Marks	External Marks		Total Marks	
			Max	Max	Min	Max	Min
1	PMT101	Linear Algebra	30	70	21	100	35
2	PMT102	Group theory and matrices	30	70	21	100	35
3	PMT103	Analysis-I	30	70	21	100	35
4	PMT104	Classical Mechanics	30	70	21	100	35
5	PMT105	Ordinary Differential Equation	30	70	21	100	35
Total						500	

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M.Sc.(Mathematics) 2019-2021
Choice Based Credit System

S.No.	Subject Code	Subject Name	L	T	P	Credit
1.	PMT101	Linear Algebra	3	1	0	4
2.	PMT102	Group theory and matrices	3	1	0	4
3.	PMT103	Analysis-I	3	1	0	4
4.	PMT104	Classical Mechanics	3	1	0	4
5.	PMT105	Ordinary Differential Equation	3	1	0	4
Total			15	4	4	20

R.K.D.F. UNIVERSITY, RANCHI

M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc(mathematics)	Linear Algebra	PMT101

UNIT-I
Vector spaces, linear independence; linear transformations, matrix representation of a linear transformation; isomorphism between the algebra of linear transformations and that of matrices;

UNIT-II
Similarity of matrices and linear transformations; trace of matrices and linear transformations, characteristic roots and characteristic vectors, characteristic polynomials, relation between characteristic polynomial and minimal polynomial; Cayley-Hamilton theorem (statement and illustrations only); diagonalizability, necessary and sufficient condition for diagonalizability;

UNIT-III
Projections and their relation with direct sum decomposition of vector spaces; invariant subspaces; primary decomposition theorem, cyclic subspaces; companion matrices; a proof of Cayley-Hamilton theorem; triangulability; canonical forms of nilpotent transformations; Jordan canonical forms; rational canonical forms.

UNIT-IV
Inner product spaces, properties of inner products and norms, Cauchy-Schwarz inequality; orthogonality and orthogonal complements, orthonormal basis, Gram-Schmidt process; adjoint of a linear transformation; Hermitian, unitary and normal transformations and their diagonalizations.

UNIT-V
Forms on inner product spaces and their matrix representations; bilinear forms; Hermitian forms; symmetric bilinear forms; orthogonal diagonalization of real quadratic forms.

Textbooks:
1. Linear Algebra – P. B. Bhattacharya, S. K. Jain and S. R. Nagpal

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc(mathematics)	Group Theory And Matrices	PMT102

UNIT I
GROUP THEORY
Groups: Definitions, Preliminary results, equivalent definitions, Subgroups, Cyclic Group and its subgroups, Cosets of a subgroup in a group, Lagrange's Theorem and it's applications.

UNIT II
Normal subgroups, Quotient group, Homomorphism, Fundamental theorem of homomorphism. Permutations, Permutation group, Symmetric and Alternating groups. Cayley's Theorem.

UNIT III
MATRICES
Different types of Matrices, Algebra of Matrices, Adjoint and inverse of a Matrix, different ways of finding inverses. Elementary row and column operations. Elementary matrices, equivalent matrices, Rank of a matrix, invariance of rank through elementary row/column operations, rank of sum and product of matrices and related theorems.

UNIT IV
Solution of a system of linear equations via matrix methods, Consistency, Inconsistency conditions.

References:
1. John B. Fraleigh, A First Course in Abstract Algebra, Tenth Ed., Pearson, 2002.
2. Joseph A. Gallian, Contemporary Abstract Algebra,4th Ed., Narosa Publishing House, New Delhi, 1999.
3. Topics in Algebra: I N Herstein.
4. Basic Abstract Algebra: P B Bhattacharya, Cambridge Univ. Press.
5. Matrices - Shanti Narayan.
6. Matrices - A R Vashishtha.

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc(mathematics)	Analysis-1	PMT103

UNIT I
Brief review of sets, relations and functions. Finite and infinite sets, countable and uncountable sets, Schroder-Bernstein theorem, Ordered fields, least upper bound property, the field of real numbers, Archimedean property, density of rational numbers, existence of nth root of positive real numbers, exponential and logarithm, the extended real number system, the complex field.

UNIT II
Numerical sequences and their convergence, bounded sequences, Cauchy sequences, construction of realnumbers using Cauchy sequences; series of complex numbers, convergence of series, series of nonnegative terms, the number e, the root and ratio tests, limit supremum and limit infimum, power series, summation by parts, absolute convergence, addition and multiplication of series, rearrangements(statement only).

UNIT III
Euclidean spaces, metric spaces, open and closed sets, limit points, interior points,compact spaces;statements only of the following: nested interval theorem, Heine-Borel theorem, and Bolzano-Weierstrass' threorem.

UNIT IV
Limits of functions, continuous functions, continuity and compactness, uniform continuity, connected sets, connected subsets of real numbers, continuity and connectedness, intermediate value theorem; discontinuities and their classifications, monotonic functions, infinite limits and limits at infinity.

UNIT-V
Differentiation of real-valued functions and its elementary properties; mean value theorem; Taylor's theorem; differentiation of vector-valued functions; elementary properties of Riemann integral (brief review); integration of vector-valued functions.

Textbooks:
1. Principles of Mathematical Analysis (5th edition) – W. Rudin, McGraw.

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M.Sc.(Mathematics)

Branch	Subject title	Subject code
M.Sc.(mathematics)	Classical Mechanics	PMT104

UNIT I
Generalized coordinates; holonomic & non-holonomic systems; D'Alembert's principle; Lagrange's equations; calculus of variations.

UNIT II
Hamilton's principle, Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-conservative and non-holonomic systems, conservation theorems and symmetry properties.

UNIT III
Eulerian angles; Euler's theorem on the motion of a rigid body; infinitesimal rotations; rate of change of a vector; coriolis force; Euler's equations of motion; force free motion of a rigid body; heavy symmetrical top with one point fixed.

UNIT IV
Hamilton's equations of motion, conservation theorems and physical significance of Hamiltonian, Hamilton's equations from variation principle, principle of least action.

UNIT V
Equations of canonical transformation; integral invariants of Poincare'; Lagrange and Poisson brackets as canonical invariants, equations of motion in Poisson bracket notation; infinitesimal contact transformations; constants of motion and symmetry properties.

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc. (mathematics)	Ordinary Differential Equation	PMT105

UNIT I
Linear equations with constant coefficients; the second and higher order homogeneous equation; initial value problems for second order equations; existence theorem; uniqueness theorem; linear dependence and independence of solutions; the Wronksian and linear independence; a formula for the Wronksian; the non homogeneous equation of order two.

UNIT II
Linear equations with variable coefficients, initial value problems for the homogeneous equations; existence theorem; uniqueness theorem; solutions of homogeneous equations; the theorem on n linearly independent solutions; the Wronksian and linear independence;

UNIT III
Existence and uniqueness of solutions – introduction; equations with variable separated; exact equations, Lipschitz condition; non-local existence of solutions; uniqueness of solutions; existence and uniqueness theorem for first order equations; statement of existence and uniqueness theorem for the solutions of ordinary differential equation of order n.

UNIT IV
Initial value problems for the homogeneous equations; solutions of homogeneous equations; Wronskian and linear independence; non-homogeneous equations; homogeneous equations with analytic coefficients; Legendre equation, justification of power series method; Legendre polynomials and Rodrigues' formulae.

UNIT V
Linear equations with regular singular points – introduction; Euler equation; second order equations with regular singular points – example and the general case, convergence proof, exceptional cases; Bessel equation; regular singular points at infinity.

Reference books:
1. Elementary Differential Equations (3rd Edition) – W. T. Martain and E. Relssner
2. Theory of Ordinary Differential Equations – E. A. Codington and N. Levinson, TMH

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Scheme
Semester 2

S.No.	Subject Code	Subject Name	Marks Distribution				
			Internal Marks	External Marks		Total Marks	
			Max	Max	Min Max		Min
1	PMT201	Real Analysis	30	70	21	100	35
2	PMT202	Partial Differential Equation	30	70	21	100	35
3	PMT203	Programming in C	30	70	21	100	35
4	PMT204	Ring Theory	30	70	21	100	35

Practical

Total				
			Max	Min
1.	PMT253	Programming in C Lab	50	25

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Choice Based Credit System

S.No.	Subject Code	Subject Name	L	T	P	Credit
1.	PMT101	Real Analysis	3	1	0	4
2.	PMT102	Partial Differential Equation	3	1	0	4
3.	PMT103	Programming in C	3	1	0	4
4.	PMT104	Ring Theory	3	1	0	4
5.	PMT105	Programming in C Lab			4	2
Total			12	4	4	18

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Branch	Subject title	Subject Code
M.Sc.(mathematics)	Real Analysis	PMT201

UNIT-I
Sequences of functions, pointwise and uniform convergence; uniform convergence and continuity; uniform convergence and integration; uniform convergence and differentiation; nowhere differentiable functions; Statement of Stone-Weierstrass' theorem for a real and complex-valued functions on an interval.

UNIT-II
Directional derivatives; derivatives of functions of several variables and their interrelationship; chain rule; mean value theorem; higher order partial derivatives; equality of mixed partial derivatives, Schwarz lemma; Taylor's theorem.

UNIT-III
Injective mapping theorem, surjective mapping theorem, inverse function theorem and implicit function, theorem of functions of two and three (for analogy) variables; extremum problems with and without constraints of functions of two and three (for analogy) variables.

UNIT-IV
Lebesgue integral, Lebesgue integrable functions, properties of integrals, Lebesgue's monotone convergence theorem, Fatou's lemma, Lebesgue's dominated convergence theorem, integration of complex valued functions, functions of class L2 , Fourier series, Riesz-Fischer theorem.

References:
1. Principles of Mathematical Analysis – W. Rudin, McGraw Hill

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc.(mathematics)	Partial Differential Equation	PMT202

UNIT I

Definition of PDE, origin of first-order PDE; determination of integral surfaces of linear first order partial differential equations passing through a given curve; surfaces orthogonal to given system of surfaces; non-linear PDE of first order, Cauchy's method of characteristic; compatible system of first order PDE; Charpit's method of solution, solutions satisfying given conditions, Jacobi's method of solution

.

UNIT II

Origin of second order PDE, linear second order PDE with constant coefficients, linear second order PDE with variable coefficients; characteristic curves of the second order PDE; Monge's method of solution of non-linear PDE of second order.

UNIT III

Separation of variables in a PDE;
Laplace's equation, elementary solutions of Laplace's equations;
Families of equipotential surfaces.

UNIT IV

Wave equation, the occurrence of wave equations, elementary solutions of one dimensional wave equation; vibrating membranes, three dimensional problems.

UNIT V

Diffusion equation, resolution of boundary value problems for diffusion equation, elementary solutions of diffusion equation, separation of variables.

Text Book:

1. Elements of Partial Differential Equation (3rd edition) – I. N. Sneddon, McGraw Hill.
2. Advanced Engineering mathematics – H.K. Dass, S.Chand.

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc(mathematics)	Programming in 'C'	PMT203

Unit – I

Program Logic development Using algorithm and Flowchart, Historical development of ' C', constants, variables and keywords, 'C' instructions. Data types – int, float, double, char, void, short, long, long double, signed, unsigned.

Unit – II

Decision control structure:- if statement, if-else statement , the conditional operators. Case control structure: switch statement, goto statement. 'C' operators: Arithmetic, relational and logical. Development of 'C' program using Decision control & Case control structure.

Unit – III

Operators:- Increment and Decrement operators, Bitwise operator, Operators precedence, arithmetic and logical expressions evolution. Loop Control Structure:- for loop, while loop and do-while loop, Break statement, continue statement. Development of 'C' programs using loops.

Unit – IV

Arrays: One dimension array, 2D array, 3D array, Introduction to Pointers. Functions: Function declaration and prototypes, Passing values between functions:- call by value. Development of 'C' programs using Arrays, functions.

Unit – V

Storage classes in 'C', Structures:- declaring a structure, accessing structure element, how structure elements are stored, array of structures, union.

Text Books:

1. Let US C by Yashwant Kanitkar
2. Programming in C by E. Balaguruswami

Reference Books:

1. Schaum's Series 'C' Programming
2. The complete reference in C/C++ Herbert Shield
3. Working with C by Yashwant Kanitkar.

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M.Sc.(Mathematics)

Branch	Subject title	Subject Code
M.Sc.(mathematics)	Ring Theory	PMT204

UNIT I

Ring: Definition and examples, commutative ring, ring with unity, unit in a ring, Matrix ring, Boolean ring, Ring of continuous functions. Direct product of rings, properties of rings, subrings.
Nilpotent element, idempotent element , zero divisors, integral domain, division ring and field.
Characteristic of a ring.

UNIT II

ldeal, ideal generated by a subset of a ring, simple ring, factor rings, operations on ideals, prime and maximal ideals..

UNIT III

Polynomial rings over commutative rings, division algorithm ideal domains, factorization of polynomials, reducibility Eisenstein's criterion.

UNIT IV

Ring homomorphisms, properties of ring homomorphisms, lsomorphism theorems l, ll and lll, field of quotients

References:

1.. John B- Fraleigh, A First course in Abstract Algebra, Tth Ed., pearson, 2002.
2. Joseph A- Gallian, Contemporory Abstract Algebro,4th Ed., Narosa publishing House, New Delhi.

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SCHEME
Semester – III

No.	Subject Code	Subject Title	Marks Allotted				
			Internal Marks	Theory Marks		Total Marks	
			Max	Max	Min	Max	Min
1.	PMT301	TOPOLOGY	30	70	21	100	35
2.	PMT302	COMPLEX FUNCTION THEORY	30	70	21	100	35
3.	PMT303	NUMERICAL ANALYSIS	30	70	21	100	35
	PMT304	APPLICATION OF MATHEMATICS IN ENVIRONMENT	30	70	21	100	35
					128	**400**	

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Choice Based Credit System

S.No.	Subject Code	Subject Name	L	T	P	Credit
1.	PMT301	Topology	5	1	0	6
2.	PMT302	Complex Function Theory	5	1	0	6
3.	PMT303	Numerical Analysis	5	1	0	6
4.	PMT304	Application of Mathematics in Environment	3	1	0	4
Total			20	4	0	22

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M.Sc.(Mathematics)

Syllabus
Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Mathematics)	TOPOLOGY	PMT301

UNIT I

Definition and examples of topological spaces; basis and sub basis; order relations, dictionary order, order topology; subspace topology; Kuratowski's closure axioms.

UNIT II

Continuity and related concepts; product topology; quotient topology; a brief introduction to minimal uncountable well ordered set S_Ω; countability axioms; Lindelof spaces and separable spaces.

UNIT III

Connected spaces, generation of connected sets; component, path component; local connectedness, local path-connectedness.

UNIT IV

Compact spaces; limit point compact and sequentially compact spaces; locally compact spaces; one point compactification; finite product of compact spaces, statement of Tychonoff's theorem.

UNIT V

Separation axioms; Urysohn's lemma; Tietze's extension theorem; statement of Urysohn's metrization theorem.

Textbooks:

1.General Topology – J. L. Kelley, Springer Verlag, New York, 1990.

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Syllabus
Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Mathematics)	COMPLEX FUNCTION THEORY	PMT302

UNIT I

Brief survey of formal power series, radius of convergence of power series, exponential, cosine and sine, logarithm functions introduced as power series, their elementary properties.

UNIT II

Integration of complex-valued functions and differential 1-forms along a piecewise differentiable path, primitive , local primitive and primitive along a path of a differential 1- form, homotopic pats, simply connected domains, index of a closed path, holomorphic functions, Cauchy's theorem and its corollaries.

UNIT III

Cauchy's integral formula, Taylor's expansion of holomorphic functions, Cauchy's estimate; Liouville's theorem; fundamental theorem of algebra; zeros of an analytic function and related results; maximum modulus theorem; Schwarz' lemma.

UNIT IV

Laurents's expansion of a holomorphic function in an annulus, singularitiesof a function, removable singularities, poles and essential singularities; extended plane nd stereographic projection, residues, calculus of residues; evaluation of definite integrals; argument principle; Rouche's Theorem.

UNIT V

Complex form of equations of straight lines, half planes, circles, etc., analytic (holomorphic) function as mappings; conformal maps; Mobius transformation; cross ratio; symmetry and orientation principle; examples of images of regions under elementary analytic function.

Textbooks:

1. An Introduction To Complex Analysis – A. R. Shastri, Macmillan India Ltd., 2003.

2. Complex Variables and Applications – S. Ponnusamy, and H. Silverma.

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Syllabus
Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc (Mathematics)	NUMERICAL ANALYSIS	PMT303

UNIT I

A brief introduction to algebraic and transcendental equations and their roots; direct and iterative methods for determination of roots of these equations; initial approximations; bisection method, secant method, Regula-Falsi method, Newton-Raphson method fordetermination of roots of algebraic and transcendental equations; error analysis, rate of convergence and algorithm for each of these methods.

UNIT II

A brief introduction to systems of linear algebraic equations and their solutions, eigenvalue problem and its solution; direct and iterative methods; forward and backward substitution method; Cramer's rule; Gauss elimination method; Gauss-Jordan elimination method; Gauss-Jacobi iteration method; Gauss-Seidel iteration method; power method for eigenvalue problem; iterative method for matrix inversion; error analysis, rate of convergence and algorithm for each of these methods.

UNIT III

Lagrange and Newton interpolation; Lagrange interpolating polynomial and Newton divided differences interpolating polynomial; linear interpolation; Newton's divided difference interpolation and its generalizations; finite difference operators; relation between differences and derivatives; Gregory-Newton forward and backward difference interpolation; truncation error bounds and algorithm for each of these interpolations.

UNIT IV

Differentiation and integration; numerical differentiation; methods based on linear and quadratic interpolation with error of approximation; methods based on finite differences; optimum choice of step length; numerical integration; methods based on interpolation; determination of the error term; trapezoidal rule; Simpson's rule; error of integration; algorithms for numerical differentiation and integration.

UNIT V

Ordinary differential equations and their numerical solutions; initial value problems; error estimates; Euler-Richardson method, Runge-Kutta methods and Predictor- Corrector method; error analysis and algorithm for each of these methods; partial differential equations; finite-difference method with error analysis and algorithm.

Textbooks:

1. Numerical Methods for scientific and Engineering computation – M. K. Jain, S. R.
2. Computer Oriented Numerical Analysis – V. Rajaraman, Prentice-Hall of India Pvt.

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BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Mathematics)	APPLICATION OF MATHEMATICS IN ENVIRONMENT	PMT304

UNIT 1

Linear Equations, matrix form, row reduction; row rank and column rank, row equivalence, row reduced echelon matrices, various methods to find solutions of a system of linear equations, linear inequalities.

UNIT II

Introduction to ecology and environment; linear programming problem –introduction, graphical solution method, some exceptional cases; general linear8 programming problem, duality, simplex method; problems related to ecology and environment.

UNIT III

Integral equations of convolution type and their solutions by Laplace transform, Fredholm's theorems; integral equations with symmetric kernel; eigen values and eigen functions of integral equations and their simple properties.

UNIT IV

Generalized functions; Minusinkski's operational calculus of one variable (algebra of addition and convolution of functions, ordered pairs of functions, convolution quotients of a function with a nonzero function), Dirac delta function.

UNIT V

Eigen value problem; ordinary differential equations of the Sturm-Liouville type; eigen values and eigen functions; expansion theorem; extrema properties of the eigen values of linear differential operators, formulation of the eigen value problem of a differential operator as a problem of integral equation.

Textbook:

1. Linear Algebra (2nd edition) – K. Hoffman and R. Kunze, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

2. Introduction to Matrices and Linear Transformations (3rd edition) – D. T. Finkbeiner, D.B. Taraporevala, Bombay, 1990.

3. Operations Research (for Group B) – K. Swarup, P. K. Gupta and Man Mohan, Sultan Chand & Sons, New Delhi, 2000.

Reference books:

4. Applied Operation Research: A Survey (for Group B) – G. E. Whitehouse and B. L. Wechsler, John Wiley & Sons, 1975.

5. Ecology: The Experimental Analysis of Distribution and Abundance (2nd edition) (for Group B) – C. J. Krebs, Harper and Row Publishers, 1978

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SCHEME
Semester – IV

No.	Subject Code	Subject Title	Marks Allotted				
			Internal Marks	External Marks		Total Marks	
				Max	Min	Max	Min
1	PMT401	MATHEMATICAL METHODS	30	70	21	100	35
2	PMT402	ELEMENTARY NUMBER THEORY	30	70	21	100	35
3	PMT403	ADVANCE DISCRETE MATHEMATICS	30	70	21	100	35
4	PMT404	DISSERTATION	-	-	-	300	105
Total			**90**	**210**	**63**	**600**	**210**

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Choice Based Credit System

S.No.	Subject Code	Subject Name	L	T	P	Credit
1.	PMT401	Mathematical Methods	4	1	0	5
2.	PMT402	Elementary Number Theory	4	1	0	5
3.	PMT403	Advance Discrete Mathematics	4	1	0	5
4.	PMT404	Dissertation	6	0	0	6
Total			21	3	0	21

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M.Sc.(Mathematics)

Syllabus
Semester – IV

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Mathematics)	MATHEMATICAL METHODS	PMT401

UNIT I

Laplace transforms, properties of Laplace transform, inversion formula convolution, application to ordinary and partial differential equations; Fourier transform, properties of Fourier transform, inversion formula, convolution, Parseval's equality; Fourier transform of generalized functions, application of transforms to heat wave and Laplace equation.

UNIT II

Formulation of integral equations, integral equations of Fredholm and Volterra type, solution by successive substitution and successive approximation; integral equations with degenerate kernels.

UNIT III

Integral equations of convolution type and their solutions by Laplace transform, Fredholm's theorems; integral equations with symmetric kernel; eigenvalues and eigenfunctions of integral equations and their simple properties.

UNIT IV

Generalized functions; Minusinkski's operational calculus of one variable (algebra of addition and convolution of functions, ordered pairs of functions, convolution quotients of a function with a nonzero function), Dirac delta function

.

UNIT V

Eigenvalue problem; ordinary differential equations of the Sturm-Liouville type; eigenvalues and eigenfunctions; expansion theorem; extrema properties of the eigenvalues of linear differential operators, formulation of the eigenvalue problem of a differential operator as a problem of integral equation.

Textbooks:

1. Laplace Transform Theory – M. G. Smith.

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Syllabus
Semester – IV

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc (Mathematics)	ELEMENTARY NUMBER THEORY	PMT402

UNIT I

Divisibility; Euclidean algorithm; primes; congruences; Fermat's theorem, Euler's theorem and Wilson's theorem; Fermat's quotients and their elementary consequences; solutions of congruences; Chinese remainder theorem; Euler's phi-function.

UNIT II

Congruence modulo powers of prime; power residues; primitive roots and their existence; quadratic residues; Legendre symbol, Gauss' lemma about Legendre symbol; quadratic reciprocity law; proofs of various formulations; Jacobi symbol.

UNIT III

Greatest integer function; arithmetic functions, multiplicative arithmetic functions (elementary ones); Mobius inversion formula; convolution of arithmetic functions, group properties of arithmetic functions; recurrence functions; Fibonacci numbers and their elementary properties.

UNIT IV

Diophantine equations – solutions of $ax + by = c$, $x^2 + y^2 = z^2$, $x^4 + y^4 = z^2$; properties of Pythagorean triples; sums of two , four and five squares; assorted examples of diophantine equations.

UNIT V

Simple continued fractions, finite and infinite continued fractions, uniqueness, representation of rational and irrational numbers as simple continued fractions, rational approximation to irrational numbers, Hurwitz theorem, basic facts of periodic continued fractions and their illustrations.

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BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Mathematics)	ADVANCE DISCRETE MATHEMATICS	PMT403

Unit I

Automata Theory

Finite state automata & types of automata, deterministic and non deterministic finite state automata, non deterministic finite state automata (NDFSA), transition diagram. Moor Machine, Mealy Machine Turing Machine.

Unit II

Eulerian and Hamiltonian Graphs

Eulerian graph and its characterizations, Hamiltonian graph and sufficient conditions for a graph to be Hamiltonian.

Unit III

Planar graph and vertex coloring of a graph

Planar graphs, Platonic graphs. Euler's theorem for planar graphs. Vertex coloring, chromatic number, chromatic polynomial, Brooks theorem, edge coloring, chromatic index, map coloring, Five color theorem.

Unit IV

Algorithms in graph theory

NP - complete problems, good algorithms, Connector problem and Kruskal's algorithm. Algorithms for Chinese postman problem. The Shortest path problem, Dijkstra's algorithm.

References:

- R. J. Wilson, Introduction to Graph Theory, 5th ed., Addison Wesley, 2012.
- John Clark and Derek Allan Holton, A first look at Graph Theory, World Sc., 1991
- Narsingh Deo, Graph theory, PHI New Delhi
- Uday Singh Rajpoot, Advanced Discreet Mathematics, PHI (Eastern economic edition.

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