KAKARAPARTI BHAVANARAYANA COLLEGE (Autonomous)

Department Of Mathematics

Prpgramme	Semester:	Title of The Course		Course Code:		W.E.F
B.Sc.(MPC, MPCS,MECS, MCCS,MSCS)	I	Differential equations		R20MAT101A		2022-23
Total No of Hours for Teaching – Learning		Instructional Hours for Week	Duration of Semester End Examination in Hours	Max Marks		Credits
60 Hours		Theory: 4 / Practical: 2	3 Hours	CIA: 40	SEE: 60	4+1

COURSE OBJECTIVES

The aim of this course is to provide necessary information to solve ordinary differential equations and their applications.

COURSE OUTCOMES

On Completion of this course the students will be able to:

- To know the concept of first order & first degree differential equations
- Knowledge of Orthogonal Trajectories.
- Knowledge of Higher order Differential equations.
- Knowledge of order linear Differential equations.
- Evaluate basic application problems described by second order linear differential equations with constant coefficients.

UNIT – I (12 Hours) :Differential Equations of first order and first degree :

Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; Change of Variables.

UNIT – II (12 Hours): Orthogonal Trajectories.

Differential Equations of first order but not of the first degree :

Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain.x (or y); Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III (12 Hours): Higher order linear differential equations-I :

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.

General Solution of f(D)y=0

General Solution of f(D)y=Q when Q is a function of x.

$\frac{1}{f(D)}$ is Expressed as partial fractions

P.I. of f(D)y = Q when Q= be^{ax}

P.I. of f(D)y = Q when Q is b sin ax or b cosax.

UNIT – IV (12 Hours) : Higher order linear differential equations-II :

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q= bX^k

P.I. of f(D)y = Q when Q= $e^{ax}V$

P.I. of f(D)y = Q when Q= xV

P.I. of f(D)y = Q when Q= X^mV

UNIT –V (12 Hours): Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's Linear Equations, Miscellaneous Differential Equations .

Reference Books :

1. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. BalachandraRao& HR Anuradha-universities press.

BLUE PRINT :

UNIT	SAQ	LAQ
I	2	2
II	2	2
III	2	2
IV	1	2
V	1	2

KAKARAPARTI BHAVANARAYANA COLLEGE (Autonomous)
Department Of Mathematics

Programme	Semester:	Title of The Course	Course Code:	W.E.F
I B.Sc(MPC,MSCS,MPCS, MECS,MCCS).	II	SOLID GEOMETRY	R20MAT201 A	2022-23

Total No of Hours for Teaching – Learning	Instructional Hours for Week		Duration of Semester End Examination in Hours	Max Marks		Credits
60 Hours	Theory	Practical	3 Hours	CIA	SEE	4+1
	4	2		25	75	

COURSE OBJECTIVES

The aim of this course is to provide necessary information to solid Geometry and their applications.

COURSE OUTCOME

- Knowledge of the concept of three dimensional geometry
- To get the knowledge of planes
- To basic idea of lines, sphere and cones
- Knowledge of numerical solutions in the fields of construction, defence .etc.
- Knowledge of cones

UNIT – I (12 hrs) : The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs) : The Line :

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line;

UNIT – III (12 hrs) : Sphere :

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Tangent plane, plane of contact, polar plane, pole of a point conjugate Points , conjugate planes .

UNIT – IV (12 hrs) : Sphere &Cones :

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres, simplified form of the equation of two spheres .

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve;; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone.

UNIT – V (12 hrs): Cones :

Enveloping cone of a sphere; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle , Condition that a cone may have three mutually perpendicular generators; Intersection of a line and a

quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones , intersection of two cones with a common vertex .

Text Book :

Analytical solid geometry by shanti Narayan &P.K. Mittal , published by S-Chand & company limited 7th addition .

Reference Books :

1. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, Published by S. Chand & Company, New Delhi.

2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, Published by Wiley Eastern Ltd., 1999.

BLUE PRINT :

UNIT	SAQ	LAQ
I	2	2
II	2	2
III	2	2
IV	1	2
V	1	2

KAKARAPARTI BHAVANARAYANA COLLEGE (Autonomous)
Department Of Mathematics

Class:	Semester:	Title of The Paper:	Paper Code:	W.E.F
II B.Sc(MPC,MPCS,MSCS, MECS,MCCS).	III	ABSTRACT ALGEBRA	R20MAT301A	2022-23

Total No of Hours for Teaching - Learning	Instructional Hours for Week		Duration of Semester End Examination in Hours	Max Marks		Credits
60 Hours	Theory	Practical	3 Hours	CIA	SEE	5
	4	2		25	75	

LEARNING OBJECTIVES
The aim of this course is to learn the nature of different algebraic structures and their relationships

Course Outcomes:

After successful completion of this course, the student will be able to;

- Acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
- get the significance of the notation of a normal subgroups.
- get the behavior of permutations and operations on them.
- study the homomorphisms and isomorphisms with applications.
- Knowledge of the ring theory concepts with the help of knowledge in group theory and to prove thetheorems.
- Understand the applications of ring theory in various fields.

UNIT – I (12 Hours)

GROUPS :

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementaryproperties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNIT – II (12 Hours)

SUBGROUPS :

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition-examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange's Theorem :

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT –III (12 Hours)

NORMAL SUBGROUPS :

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – quotient group – criteria for the existence of a quotient group.

HOMOMORPHISM :

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

UNIT – IV(12Hours)

PERMUTATIONS AND CYCLIC GROUPS :

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclicpermutations – transposition – even and odd permutations – Cayley's theorem.

Cyclic Groups :- Definition of cyclic group – elementary properties – classification of cyclic groups.

UNIT – V (12 Hours)

RINGS :

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

Text Book :

A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

Reference Books :

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.

BLUE PRINT FOR QUESTION PAPER

PATTERNCOURSE-III,

ABSTRACT ALGEBRA

Unit	**TOPIC**	**S.A.Q**(including choice)	**E.Q**(including choice)	**Total Marks**
I	Groups	2	2	30
II	Subgroups, Cosets & Lagrange's Theorem	1	2	25
III	Normal Subgroups and Homomorphism	1	2	25
IV	Permutations and Cyclic groups	2	2	30
V	Rings	2	2	30

KAKARAPARTI BHAVANARAYANA COLLEGE (Autonomous)
Department Of Mathematics

Class:	Semester:	Title of The Paper:	Paper Code:	W.E.F
II B.Sc(MPC,MPCS,MECS, MSCS,MCCS.	IV	REAL ANALYSIS	R20MAT401A	2022-23

Total No of Hours for Teaching - Learning	Instructional Hours for Week		Duration of Semester End Examination in Hours	Max Marks		Credits
60 Hours	Theory	Practical	3 Hours	CIA	SEE	5
	4	2		25	75	

LEARNING OBJECTIVES
The aim of this course is to learn the nature of different algebraic structures and their relationships

Course Outcomes:

After successful completion of this course, the student will be able to

- To get clear idea about the real numbers and real valued functions.
- Knowledge of the skills of analyzing the concepts and applying appropriate methods fortesting convergence of a sequence/ series.
- Knowledge of the test the continuity and differentiability and Riemann integration of a function.
- know the geometrical interpretation of mean value theorems
- Knowledge of the Integration

UNIT – I (12 Hours)

REAL NUMBERS :

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supremum property; intervals. (No question is to be set from this portion).

Real Sequences:

Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequencesand the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT –II (12 Hours)

INFINITIE SERIES :

Series : Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test

2. Cauchy's n^{th} root test or Root Test.
3. D'-Alemberts' Test or Ratio Test.
4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence

UNIT – III (12 Hours)

CONTINUITY :

Limits : Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. (No question is to be set from this portion).

Continuous functions : Continuous functions, Combinations of continuous functions, ContinuousFunctions on intervals, uniform continuity.

UNIT – IV (12 Hours)

DIFFERENTIATION AND MEAN VALUE THEORMS :

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem

UNIT – V (12 Hours)

RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral asthe limit of a sum, Mean value Theorems.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.

Text Book:

Introduction to Real Analysis by Robert G.Bartle and Donlad R. Sherbert, published by John Wiley.

Reference Books:

1.A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, published by S. Chand & CompanyPvt. Ltd., New Delhi.

2.Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand & Company Pvt. Ltd., New Delhi.

BLUE PRINT FOR QUESTION PAPER

PATTERNCOURSE-IV,

REAL ANALYSIS

Unit	**TOPIC**	**S.A.Q**(including choice)	**E.Q**(including choice)	**Total Marks**
I	Real Number System and Real Sequence	2	2	30
II	Infinite Series	1	2	25
III	Limits and Continuity	1	2	25
IV	Differentiation and Mean Value Theorem	2	2	30
V	Riemann Integration	2	2	30

KAKARAPARTI BHAVANARAYANA COLLEGE (Autonomous)
Department Of Mathematics

Class:	Semester:	Title of The Paper:	Paper Code:	W.E.F
II B.Sc(MPC,MPCS,MECS, MSCS,MCCS.	IV	LINEAR ALGEBRA	R20MAT402A	2022-23

Total No of Hours for Teaching - Learning	Instructional Hours for Week		Duration of Semester End Examination in Hours	Max Marks		Credits
60 Hours	Theory	Practical	3 Hours	CIA	SEE	5
	4	2		25	75	

LEARNING OBJECTIVES

The aim of this course is to learn the nature of different algebraic structures and their relationships

Course Outcomes:

After successful completion of this course, the student will be able to;

- To know the concepts of vector spaces, subspaces, basises, dimension and their properties
- Knowledge of the concepts of linear transformations and their properties
- To know how to apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higherpowers of matrices without using routine methods
- Knowledge about the properties of inner product spaces and determine orthogonality in inner product spaces.
- Knowledge of Inner Product space

UNIT – I (12 Hours)

Vector Spaces-I:

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –II (12 Hours)

Vector Spaces-II:

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of aVector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT –III (12 Hours)

Linear Transformations:

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT –IV (12 Hours)

Matrix :

Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations,Characteristic equations, Characteristic Values & Vectors of square matrix, Cayley – Hamilton Theorem.

UNIT –V (12 Hours)

Inner product space :

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality,Triangle Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Linear algebra and its applications / Problem Solving.

Text Book:

Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir,Meerut-250002.

Reference Books :

1. Matrices by Shanti Narayana, published by S.Chand Publications.
2. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition),New Delhi.
3. Linear Algebra by Stephen H. Friedberg et. al. published by Prentice Hall of India Pvt. Ltd. 4th Edition, 2007

BLUE PRINT FOR QUESTION PAPER

PATTERNCOURSE-V,

LINEAR ALGEBRA

Unit	TOPIC	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
I	Vector spaces - I	2	2	30
II	Vector spaces - II	1	2	25
III	Linear Transformation	2	2	30
IV	Char. values and char. Vectors	1	2	25
V	Inner product spaces	2	2	30

KAKARAPARTI BHAVANARAYANA COLLEGE – AUTONOMOUS
DEPARTMENT OF MATHEMATICS

PROGRAMME	SEMESTER	TITLE OF THE PAPER		COURSE CODE	W.E.F
B.Sc.(MPC, MPCs, MECs, MCCs, MSCs, DS)	V/VI	NUMERICAL METHODS		**R20MATA501/ R20MATA601**	2022-23
TOTAL NO.OF HOURS FOR TEACHING - LEARNING		**INSTRUCTIONAL HOURS FOR WEEK**	**DURATION OF SEMESTER END EXAMINATION IN HOURS**	**MAX MARKS**	**CREDITS**
60 Hours		3Theory+2practical	3 hours	75(SEE)+25(CIA)	5

Learning outcomes:

Students after successful completion of the course will be able to

- ❖ To Know the subject of various numerical methods that are used to obtain approximate solutions
- ❖ Understand various finite difference concepts and interpolation methods.
- ❖ Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
- ❖ Find numerical solutions of ordinary differential equations by using various numerical methods.
- ❖ Analyze and evaluate the accuracy of numerical methods.

SYLLABUS

Unit – 1: Finite Differences and Interpolation with Equal intervals (15h)

1. Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions,
2. Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series.
3. Newton's formulae for interpolation. Central Difference Interpolation Formulae.

Unit – 2: Interpolation with Equal and Unequal intervals **(**15h)

1. Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling's formula, Bessel's formula.
2. Interpolation with unevenly spaced points, divided differences and properties, Newton's divided differences formula.
3. Lagrange's interpolation formula, Lagrange's Inverse interpolation formula.

Unit – 3: Numerical Differentiation (15h)

1. Derivatives using Newton's forward difference formula, Newton's back ward difference formula,
2. Derivatives using central difference formula, Stirling's interpolation formula,
3. Newton's divided difference formula, Maximum and minimum values of a tabulated function.

Unit – 4: Numerical Integration (15h)

1. General quadrature formula one errors, Trapezoidal rule,
2. Simpson's1/3– rule, Simpson's 3/8 – rule, and Weddle's rules,
3. Euler – McLaurin Formula of summation and quadrature, The Euler transformation.

Unit – 5: Numerical solution of ordinary differential equations (15h)

1. Introduction, Solution by Taylor's Series,
2. Picard's method of successive approximations,
3. Euler's method, Modified Euler's method, Runge – Kutta methods.

III. References:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi-110001, 2006.
2. P.Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis.
S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.
3. R.Gupta, Numerical Analysis, Laxmi Publications (P) Ltd., New Delhi.
4. H.C Saxena, Finite Differences and Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
5. S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
6. Web resources suggested by the teacher and college librarian including reading material.

BLUE PRINT :

	SAQ	LAQ
UNIT – I	2	2
UNIT – II	2	2
UNIT – III	1	2
UNIT – IV	2	2
UNIT – V	1	2

KAKARAPARTI BHAVANARAYANA COLLEGE – AUTONOMOUS
DEPARTMENT OF MATHEMATICS

ROGRAMME	EMESTER	TITLE OF THE PAPER		COURSE CODE	W.E.F
B.Sc.(MPC,MPCs, MECs, MCCs,MSCs)	V/VI	MATHEMATICAL SPECIAL FUNCTIONS		**R20MATA502/ R20MATA602**	2022-23
TOTAL NO.OF HOURS FOR TEACHING – LEARNING		**NSTRUCTIONAL HOURS FOR WEEK**	**DURATION OF SEMESTER END EXAMINATION IN HOURS**	**MAX MARKS**	**CREDITS**
60 Hours		3Theory+2practical	3 hours	75(SEE)+25(CIA)	5

Learning outcomes:

Students after successful completion of the course will be able to:

- To know the Beta and Gamma functions, their properties and relation between these two functions, understand the orthogonal properties of Chebyshev polynomials and recurrence relations.
- Find power series solutions of ordinary differential equations.
- solve Hermite equation and write the Hermite Polynomial of order (degree) n, also find the generating function for Hermite Polynomials, study the orthogonal properties of Hermite Polynomials and recurrence relations.
- Solve Legendre equation and write the Legendre equation of first kind, also find the generating function for Legendre Polynomials, understand the orthogonal properties of Legendre Polynomials.
- Solve Bessel equation and write the Bessel equation of first kind of order n, also find the generating function for Bessel function understand the orthogonal properties of Bessel unction.

SYLLABUS

Unit – 1: Beta and Gamma functions, Chebyshev polynomials (15h)

1. Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions.
2. Another form of Beta Function, Relation between Beta and Gamma Functions.
3. Chebyshev polynomials, orthogonal properties of Chebyshev polynomials, recurrence relations, generating functions for Chebyshev polynomials.

Unit-2: Laguerre Polynomials

1.Laguerre equation and its solution, laguerre polynomial of order (or degree) n, alternative definition of laguerre polynomial of order (or degree) n
2. Generating function for laguerre polynomials, alternating expression for the laguerre polynomials, first few laguerre polynomials.
3. Orthogonal properties of laguerres polynomials, expansion of a polynomial in a series of laguerre polynomials.

Unit – 3: Hermite polynomials (15h)

1. Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials.

2. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials.

3. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

Unit – 4: Legendre polynomials (15h)

1. Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials.

2. Definition of $P_n(x)$, and $Q_n(x)$, General solution of Legendre's Equation (derivations not required) to show that $P_n(x)$ is the coefficient of h^n, in the expansion of $(1 - 2xh + h^2)^{\frac{-1}{2}}$

3. Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

Unit – 5: Bessel's equation (15h)

1. Definition, Solution of Bessel's equation, Bessel's function of the first kind of order n, Bessel's function of the second kind of order n.

2. Integration of Bessel's equation in series form=0, Definition of $J_n(x)$ recurrence for mulae for $J_n(x)$

3. Generating function for $J(x)$, orthogonally of Bessel functions.

II. Reference Books:

1. Dr.M.D.Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
2. J.N.Sharma and Dr.R.K.Gupta, Differential equations with special functions, Krishna Prakashan Mandir.
3. Shanti Narayan and Dr.P.K.Mittal, Integral Calculus, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
4. George F.Simmons, Differential Equations with Applications and Historical Notes, Tata

McGRAW-Hill Edition, 1994.
5. Shepley L.Ross, Differential equations, Second Edition, John Willy & sons, New York, 1974.
6. Web resources suggested by the teacher and college librarian including reading material.

BLUE PRINT:

	SAQ	LAQ
UNIT – I	1	2
UNIT – II	1	2
UNIT – III	2	2
UNIT – IV	2	2
UNIT – V	2	2