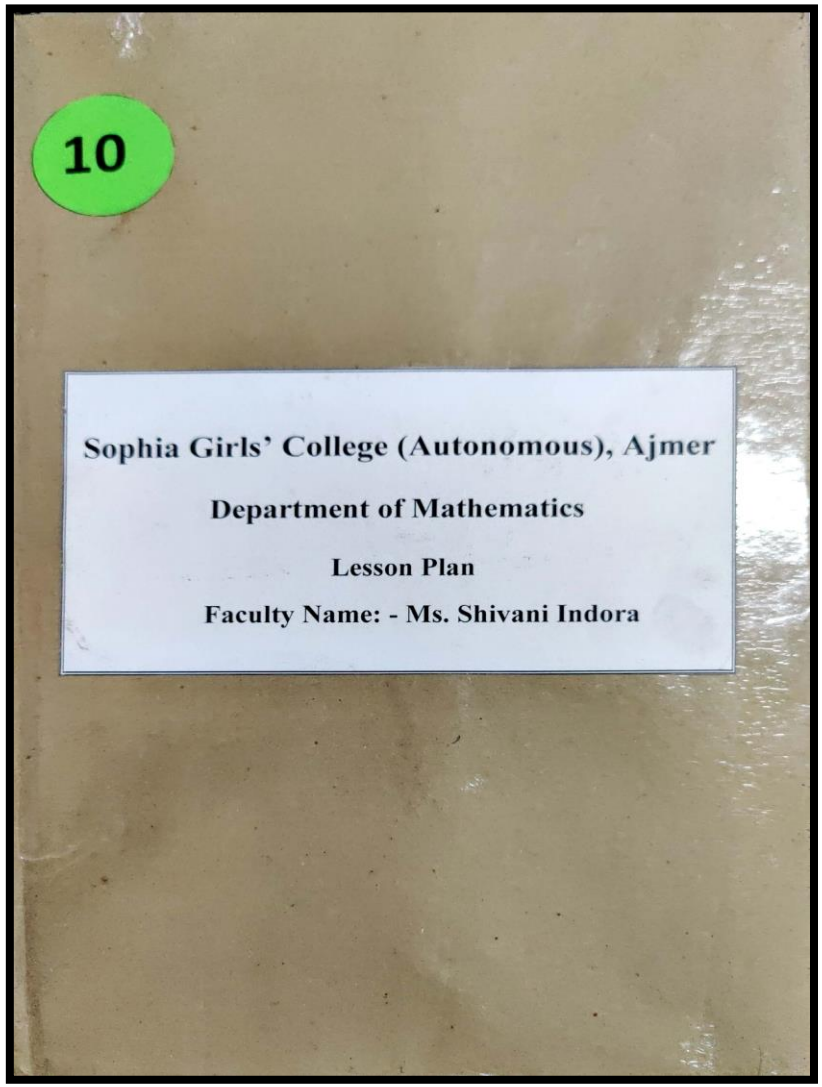
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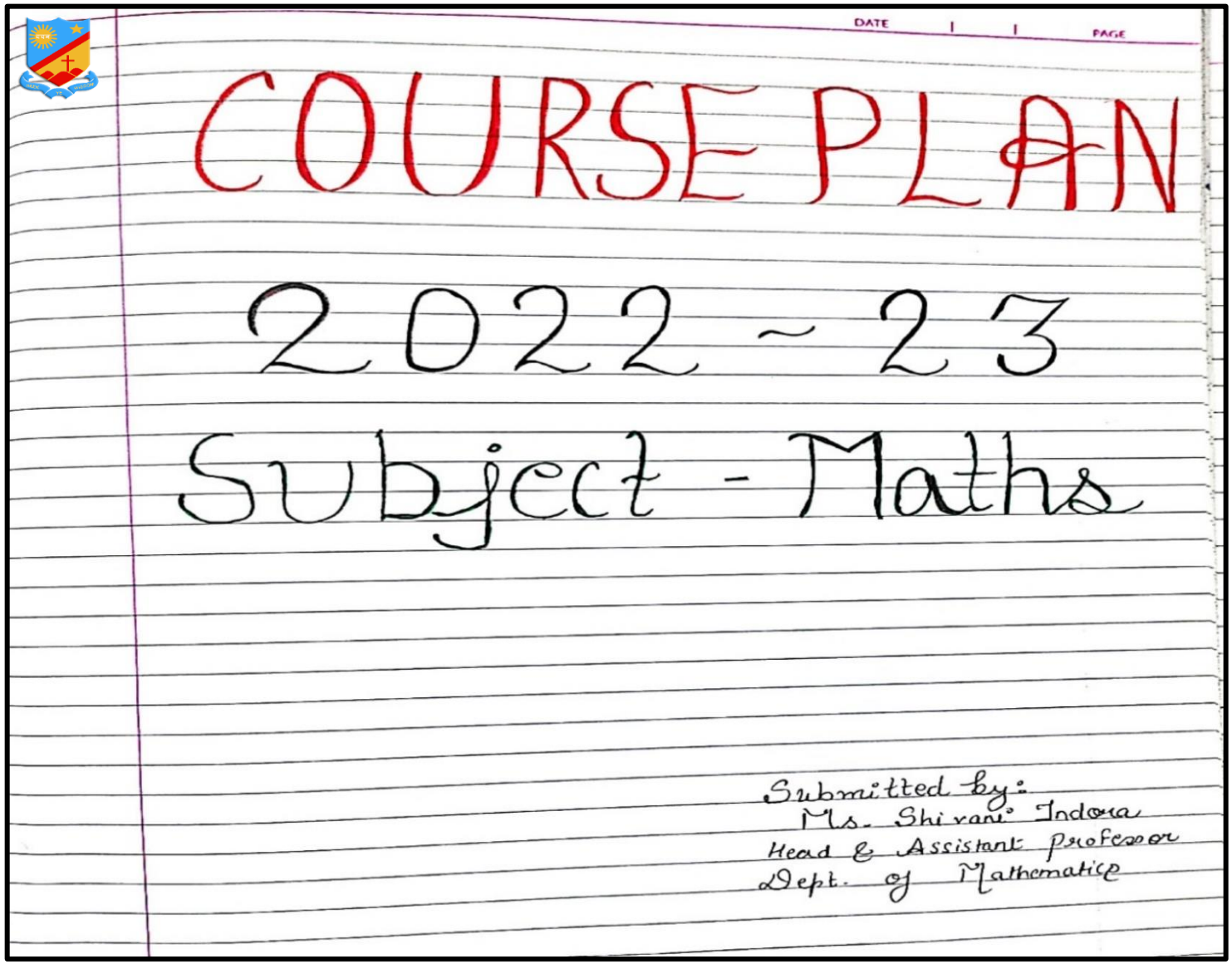
Department of Mathematics
Lesson Plan
Faculty Name: - Ms. Shivani Indora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COURSE PLAN
2022 - 23
Subject - Maths
Submitted by:
Ms. Shivani Indora
Head & Assistant Professor
Dept. of Mathematics

SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. I (SEMESTER I) — **MATRICES (PAPER I) (MAT-101)**

Max. Marks: 100 (70 External; 30 Internal) — Min. Marks: 40 (28 External; 12 Internal) — Credit: 04

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
August	**UNIT I** Matrix, Types of matrix, Elementary operations on matrices, Symmetric and Skew Symmetric matrices, Hermitian and Skew Hermitian matrices, unitary matrix.	Different types of matrices and their propertries	Inducto-Deductive method, Group Discussion. Lecture Method	Identify types of Matrix, its rank by using Normal form and Echelon form method and nature of vectors.	*Knowledge Based* -List two difference between Hermitian and Skew- Hermitian matrix Define row rank and column rank of matrix? *Understanding Based* - If A and B are unitary matrices of the same orders, then show that AB and BA are also unitary	Knowledge--60 Understanding-30 Higher Order-10
	Inverse of matrix, Linear Independence of row and column matrices.	Types of vector	Demonstration through examples on board, Flipped Classroom			
	Row rank, Column rank and Rank of matrix, Equivalence of column and row rank.	Method to find rank of Matrix	Problem solving classes, Discussion of previous year questions			
	UNIT II Applications of matrices to	Solution of Homogeneous and non-	Group Discussion,	Solve System of Linear		

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September-October	solve a system of linear (both homogeneous and non-homogenous) equations, Theorems on consistency of a system of linear equation	Homogeneous system of equation by using Rank of matrix concept	Demonstration through examples, Quiz	Equation by Matrix method, Problems related to Eigen value and Eigen vector.	matrices. -Find the condition that the equation x3 - $px^2 + q\,x + r = 0$ may have two roots equal but opposite in sign. *Higher Order Thinking Skills Based* - Show that the rank of a non-singular matrix is equal to the rank of its inverse. - Evaluate characteristic roots and characteristic vectors of the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 3 \end{bmatrix}$	
	Eigen values, Eigen vectors and the Characteristic equation of a matrix, Cayley - Hamilton theorem and its use in finding Inverse of a matrix.	Eigen values and Eigen vector of Matrix	Lecture Method on board , Open book Test, Explain Theory part by PPT			
November	**UNIT III** Relation between roots and coefficients of general polynomial equation in one variable, Transformation of equations.	Relation between roots and their coefficients	Demonstration through examples on board, Analytico-Synthetic Method	Evaluate roots of Cubic equation by Cardon's method and Biquadratic equations by Ferrari's method.		
	Descartes' rule of signs, Solution of cubic equation by Cardon's method, Solution of Biquadratic equations by Ferrari's method. **Revision Classes**	Cardon's and Ferraris method for Solution of Cubic and Biquadratic equations.	Demonstration through examples on board, Problem solving class			

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B. Sc. I (SEMESTER I) — **ABSTRACT ALGEBRA (PAPER II) (MAT-102)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
August-September	**UNIT I** Definition of a group with examples, Order of finite group, General properties of groups, Integral power of an element of a group, Order of an element of a group.	Groups and its properties	Demonstration through examples on board, Group Discussion, Inducto-Deductive method	Explain Groups, general properties of groups and Application of Lagrange's theorem.	*Knowledge Based* -What are disjoint cycles? -Define skew field. *Understanding Based* -Find all the generation of the cyclic group ($G=\{1,2,3,4\}$ X_5) -Prove that every subgroup of an Abelian group is a normal subgroup. *Higher Order Thinking Skills Based* - State and prove 'Lagrange's Theorem'	Knowledge--60 Understanding-30 Higher Order-10
	Subgroup, Generation of groups, Cyclic group, cosets decomposition, Lagrange's theorem and its consequences.	Subgroup, cyclic group and cosets properties	Lecture on board, Problem solving class			
September - October	**UNIT II** Normal subgroups and Quotient groups, Permutation, permutation group, cyclic permutation, Even and Odd permutation,	Normal subgroup and Permutation group properties	Lecture method, open Book Test, PPT to explain the some theory part.	Analyze Normal subgroups, Quotient group, Permutation group and		

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	The alternating group A_n. Morphism of groups, Homomorphism and isomorphism, The fundamental theorem of homomorphism.	Different types of Morphism and their properties	Lecture method, Problem solving class	Morphism of group.	-Find the sum and product of the following polynomials over the ring of integers (Z,+, .) and the degree of the so obtained polynomials. $f(x) = 2x^0 + 3x + 5x^2 - 4x^3$ $g(x) = 3x^0 + 4x + 2x^2 - 5x^3$	
November	**UNIT III** Ring, ring with unity, zero divisors, integral domain and field and their properties. Characteristic of a ring and integral domain, Subring, subfield, prime field, Ring morphism.	Ring and Subrings properties	Demonstration through Examples on board, Open Book Test	Solve problem related to Ring, Ideals, Quotient rings, Integral domains, and Fields.		
	Ideals (Principle, Prime and Maximal) and field of quotients of an Integral Domain. **REVISION CLASSES**	Different types of Ideals	Problem solving class			

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B. Sc. II (SEMESTER III) **LINEAR ALGEBRA (PAPER I) (MAT-301)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM III Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
August	**UNIT I** Vector space: Definition and examples of vector space, subspace, sum and direct sum of subspace, linear span, linear dependence, independence and their basic properties.	Vector space and subspace properties	Demonstration through theorems and examples on board. Flipped Classroom	Explain the concepts of vector spaces, subspaces, basis, dimension and their properties.	*Knowledge Based* - Define Quotient space. -Write the Sylvester law of nullity. *Understanding Based* - Let $F: R^2 \rightarrow R^2$ be defined by $f(x, y) = (2x + 3y, 4x - 5y)$ find the matrix representation of F relative to the basis B={(1,-2),(2,-5)}	Knowledge--50 Understanding-35 Higher Order-15
	Basis, Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Invariance of the number of elements of basis set, dimensions, Quotient space and its dimension.	Basis and Dimension of a Vector space, Quotient space	Demonstration through examples and theorems on board , Problem solving class, PPT for some theorems			
September	UNIT III	Similar matrix and	Quiz,	Compute		

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	Eigen values and Eigen vectors, similar matrices, equivalent matrices, minimal polynomial.	minimal polynomial of matrix	Demonstration through examples on board	Eigen values and Eigen vectors, minimal polynomial, Jordan Canonical of Matrix.	- Prove that the kernel of homomorphism is subspace. *Higher Order Thinking Skills Based* - The linear span $L(S)$ of any subset S of a vector space V (F) is a subspace of V generated by S. $L(S) = \{S\}$ -Prove that every n- dimensional vector space V(F) is isomorphic to $V_n(F)$	
	Diagonalization of matrices, Jordan blocks and Jordan forms.	Diagonalization problems	Demonstration through examples on board, Problem solving class			
October	**UNIT II** Homomorphism and isomorphism of vector space, theorems on space morphism, Rank and Nullity, Sylvester law of nullity, Algebra of linear transformation.	Linear transformation of vector space and Algebra of Linear transformation	PPT for some theorems, Demonstration through examples and theorems on board	Construct Homomorphism of vector space, matrix related to linear transformation and verify Sylvester law of nullity.		
	Dual spaces, Bidual spaces, Adjoint of a linear transformation, Matrix representation of a linear transformation. REVISION CLASSES	Relation between matrix and linear transformation	Demonstration through examples on board, Problem solving class			

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B. Sc. II (SEMESTER III) **DIFFERENTIAL EQUATIONS (PAPER II) (MAT-302)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM III Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
July	UNIT I Concept and formation of a differential equation, Order and degree of a differential equation, Differential equations of first order and first degree, Bernoulli's equation, Exact differential equation, integrating factors.	Differential equations solutions	Demonstration through examples on board, Analytico-Synthetic Method	Formulate the ordinary the Ordinary differential equation and solve Differential equations of first order and first degree.	*Knowledge Based* - Write necessary condition of exact equation. - Define trajectory. *Understanding Based* - Solve $(1-x)dy-(3+y)dx=0$ - Solve px + qy = pq	Knowledge--50 Understanding-35 Higher Order-15
	First order higher degree equations solving for x, y, p. Lagrange's equation, Clairaut's equation, equation reducible to Clairaut's form, Singular solution.	Solution of Differential equations of first order and higher degree.	Demonstration through examples on board, Problem solving class			

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					Higher Order Thinking Skills Based - Solve $(D^2 - 1)y = \cos h\, x$ - Solve $p + 3q = 5z + \tan(y - 3x)$	
August	**UNIT II** Linear differential equations with constant coefficients: Homogeneous and non-homogeneous linear ordinary differential equation, Geometrical meaning of a differential equation and orthogonal trajectories.	Method to find P.I. for different function in Linear differential equations with constant coefficients	Demonstration through examples on board, Quiz	Learn various techniques of getting solutions of linear differential equations with constant coefficients. linear differential equation of second order. This paper will help in skill development in the field of Real Number and their Applications.		
	Linear differential equation of second order: Reduction to normal form, Method of variations of parameters, Ordinary Simultaneous differential equations. Simultaneous equation of the form $dx / P = dy / Q = dz / R$.	Solution of Linear differential equation of second order.	Group discussion, Demonstration through examples on board, Problem solving class			
October	**UNIT III** Partial differential equation: Formation, order and degree, linear and non-linear partial differential equation of first order. Complete	Partial differential equation and their solutions	Demonstration through examples on board, Problem solving class	Solve non-linear Partial differential equation by Charpit's		

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October	solution, singular solution, General solution, solution of Lagrange's linear equations, non-linear partial differential equation of first order: solution by four standard forms. Solution of non-linear differential equation by Charpit's method.		PDF notes	Homogeneous and non-Homogeneous linear partial differential equation with constant coefficients.		
	Homogeneous and non-Homogeneous linear partial differential equation with constant coefficients, Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary function and particular integrals.	Method to find P.I. for different function in Linear partial Differential equations with constant coefficients	Analytico-Synthetic Method, Group discussion, Demonstration through examples on board			

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B. Sc. III (SEMESTER V) **METRIC SPACES AND COMPLEX ANALYSIS (PAPER I) (MAT -501)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM V Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
August	UNIT II Continuity and Differentiability of complex valued function, Analytic function, Necessary and Sufficient condition for analytic function, Cauchy – Riemann Equations (Cartesian and Polar form)	Analytic conditions for complex valued functions	Demonstration through examples and theorems on board, Flipped Classroom	Analyze Analyticity of function and Construct analytic function by Milne Thomson method.	*Knowledge Based* - Define bounded and unbounded metric space. - Write cross ratio for Z_1, Z_2, Z_3, Z_4 all are distinct. *Understanding Based* - Prove that as subset of metric space is open iff it is the union of family of open spheres -Convert Cauchy-Riemann's	Knowledge--40 Understanding-35 Higher Order-25
	Harmonic function, Conjugate Harmonic function, Construction of an analytic function by Milne Thomson method.	Method to find f(z)	Quiz, Demonstration through theorems on board, Problem solving class			
September	UNIT I Definition and examples of a metric space, Diameter of a	Metric space	Demonstration through	Explain several		

	set, Bounded set, Open sphere, Closed sphere, Open set, Properties of open set .		examples on board, PPT to explain some theorems	standard concepts of Metric space and their properties, Open and Closed sets.	equation into polar form. *Higher Order Thinking Skills Based* - Find a bilinear transformation that maps the points $z = 2, i, -2$ into $w = 1, i, -1$ respectively - State and prove sufficient conditions for $w = f(z)$ to represent a conformal mapping.	
	Interior point and interior of a set, Closed set, Properties of closed set, Limit point of a set, Derived and closure of a set, Boundary point of a set.	Properties of Limit Point, Adherent point	Problem solving class, PPT to explain some theorems			
October	**UNIT III** Conformal mapping, Isogonal mapping, Necessary and sufficient conditions for a conformal mapping. Some elementary transformations: Translation, Rotation, Magnification, Inversion.	Conformal Mapping and elementary transformations	Demonstration through examples on board	Apply the concepts of the conformal mapping, Bilinear transformation in real life problems. This paper will help in skill development in the field of higher order research related to Complex Analysis.		
	Linear transformation, Bilinear transformation, Properties of Bilinear transformation, Cross ratio, Invariant point of Bilinear transformation. **REVISION CLASSES**	Bilinear transformation	Demonstration through examples on board, Problem solving class			

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SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. III (SEMESTER V) — **LINEAR PROGRAMMING (PAPER II) (MAT -502 (A))**

Max. Marks: 100 (70 External; 30 Internal) | Min. Marks: 40 (28 External; 12 Internal) | Credit: 04

COURSE PLAN

SEM V Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
July	**UNIT I** Linear programming problem: Definition of Linear programming problem, Formulation and Solution of Linear programming problem, Feasible solution.	Solution of LPP by Graphical method	Demonstration through examples on board, Flipped Classroom	Explain several standard concepts of Metric space and their properties, Open and Closed sets.	*Knowledge Based* - Define artificial variable. - Write the condition for occurrence of degeneracy in a L.P.P. *Understanding Based* - Prove that the dual of the dual of a primal problem is the primal. - Show that the following set is a convex set.	Knowledge--40 Understanding-35 Higher Order-25
	Basic Feasible solution, Optimal solution, Convex set and their properties, Hyperplane, Basic solutions and properties.	Different type of Basic Solutions	Group discussion, Demonstration through examples on board, Problem Solving class			
August	**UNIT II** Theory of Simplex method, Fundamental Theorem of	Simplex Tableau method to solve LPP	Demonstration through examples on			

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	Linear Programming (Statement only), The Simplex algorithm, Simplex method in tableau format.		board	Analyze Analyticity of function and Construct analytic function by Milne Thomson method.	$s = \{x \mid x = (w, y, z);$ $w^2 + y^2 + z^2 \leq 1\}$ *Higher Order Thinking Skills Based* -Find the solution of L.P.P. with the help of graphical solution Min z = x - y s.t. $x - 2y \geq 0$ $4x - 3y \leq 0$ $x \geq 0, y \geq 0$ -Solve the following L.P.P. Max z = x + 2y s.t. $2x - 3y \leq 0$ $3x - y \leq 0$ $x \geq 0, y \geq 0$	
	Introduction to artificial variables, case of unbounded solutions, Big-M method, Two phase method, Degeneracy in linear programming problem.	Big M and Two phase method to solve linear programming problem	Demonstration through examples on board, PPT to explain some theoretical Points			
October	UNIT III Duality in Linear programming problem: Formulation of the dual problem, Primal-Dual relationships. Symmetric and Un-symmetric dual problem with restriction in sign, Theorems related to dual problem.	Primal-Dual Problems	Demonstration through examples on board, Quiz	Apply the concepts of the conformal mapping, Bilinear transformation in real life problems. This paper will help in skill development in the solution of Analytical Problems.		
	Revised Simplex method (standard form I and II). REVISION CLASSES	Revised Simplex method to solve LPP	Demonstration through examples on board, Problem solving class			

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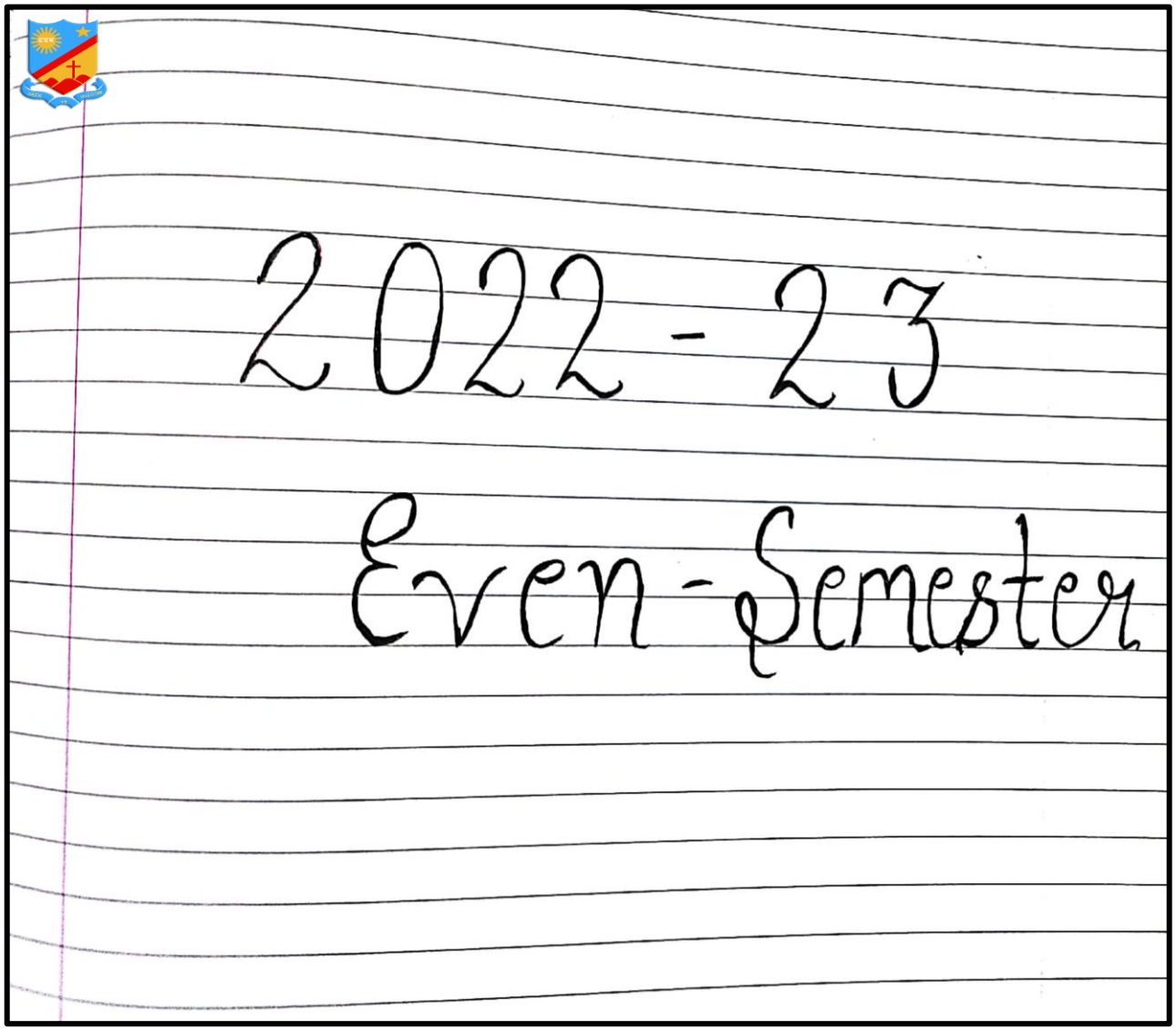
2022-23
Even-Semester

SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. I (SEMESTER II) **Vector calculus and Geometry (PAPER I) (MAT-201)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
December-January	**UNIT I** Vector differentiation, Gradient, Divergence and Curl, Identities involving these operators and related problems.	Properties of curl, gradient and divergence	Demonstration through examples on board, PDF notes	Evaluate vector Differentiation, gradient, divergence, curl, line integral and surface integral.	*Knowledge Based* - Define auxiliary circle and write its equation in polar form. - If $\vec{F} = x^2 y\hat{i} + xz\hat{j} + 2y z \hat{k}$ then find div curl F *Understanding Based* - Find the directional derivative of f = xy + yz + zx in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$	Knowledge--60 Understanding-30 Higher Order-10
	Vector integration, Line and surface integral, Theorem of Gauss, Green's and Stoke's.	Different theorem to find line and surface integral	Inducto-Deductive method, PPT to explain surface and line integral			
	UNIT II General equation of second degree, Tracing of conics,	Various characteristics of conic	Demonstration through examples on board,			

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February-March	centre of a conic, coordinates of the centre. Equation of the conic referred to centre as origin, Asymptotes of a conic, Length and position of axes of a standard conic, Tracing of Ellipse, Parabola and Hyperbola.		Recorded videos Lectures	Design different types of conic like Ellipse, Parabola and Hyperbola in Cartesian coordinate.	at the point (1, 2, 0) - Find equations to the tangent planes to the sphere $x^2 + y^2 + z^2 = 16$ which passes through the lines $x + y = 5; x - 2z = 7$ *Higher Order Thinking Skills Based* - Find div V and curl V if $V = \nabla(x^3 + y^3 + z^3 - 3xyz)$ - Derive the equation of right circular cylinder where guiding curve is the circle $x^2 + y^2 + z^2 = 9$, $x - 2y + 2z = 3$	
	The Polar equation of Conic: polar equation of a straight line, circle and conic chord, Auxiliary circle, Tracing of conic $l/r = 1+e\cos\theta$.	Equations of curve in polar coordinates	Demonstration through examples on board , Explain concept of tracing through PPT			
April	**UNIT III** Sphere, Plane section of a sphere, tangent line and tangent plane of sphere.	Sphere, Tangent plane to sphere	Demonstration through examples on board, Recorded videos	Solve Problem related to 3-Dimensional figure like Sphere, Cone and Cylinder. -This paper will help in skill development in the field of Operators, 2 D and 3 D Geometry		
	Cone, Enveloping cone, Tangent plane of cone, Reciprocal cone. Cylinder, Right circular cylinder, enveloping cylinder. **Revision Class**	Cone , Reciprocal cone Cylinder and right circular cylinder properties	Demonstration through examples on board, Problem solving class, PPT to explain 3D figures			

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SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. I (SEMESTER II) **Advanced Calculus (PAPER II) (MAT-202)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
January	**UNIT I** Derivative of length of an arc, Asymptotes in Cartesian coordinates, intersection of curve and its asymptote, Curvature, radius of curvature for (Cartesian, polar, parametric and pedal curves) Curvature, centre of curvature, chord of curvature	Asymptote to given curve and Curvature	Demonstration through examples on board, PDF notes	Sketch curves in Cartesian and polar coordinate systems.	*Knowledge Based* - Write the formula to find the derivative of an arc for the polar curve $r = f(\theta)$ - Define parallel and oblique asymptotes. *Understanding Based* - Calculate the envelope of the family of ellipse $x^2/a^2 + y^2/b^2 = 1$ *when* $a + b = c$, c being a	Knowledge--60 Understanding-30 Higher Order-10
	Tests for concavity and convexity, test for point of inflexion, singular points, curve tracing (in Cartesian and polar co-ordinates).	Check concavity and convexity of curve, trace different types of curve	Demonstration through examples on board, Recorded videos lectures			
	UNIT II					

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February	Partial Differentiation, Change of variables, Euler's theorem on homogeneous functions, Differentiation of implicit functions, Jacobians	Partial Differentiation and Jacobians	Lecture method, Group Discussion, Open Book Test	Evaluate Maxima, Minima and saddle points of function of two variables.	constant. - Evaluate $\int_0^1 x^{m-1}\left(\log\frac{1}{x}\right)^{n-1} dx = \frac{\Gamma m}{n^m} \quad m,n>0$ *Higher Order Thinking Skills Based* -Prove that the radius of curvature at a point $(a\cos^3\theta, a\sin^3\theta)$ on the curve $x^{2/3}+y^{2/3}=a^{2/3}$ is $3a/2\sin 2\theta$ - Determine the maxima and minima of $u=x^2+y^2+z^2$ subject to the conditions $ax^2+by^2+cz^2=1$ *and* $lx+my+nz=0$
	Envelopes, Evolutes, Maxima, Minima and saddle points of function of two variables.	Envelopes, maxima and minima of different curve	Lecture method, Recorded videos lectures, PPT to show envelope of given curve		
March-April	**UNIT III** Beta and Gamma function, Double integral, change of order of integration. Triple integral, Dirichlet's integral and Liouville's extension of Dirichlet's integral (statement only).	Use of Beta and Gamma relation in solving Double and Triple integration	Demonstration through examples on board, Recorded videos lectures, PDF notes	Solve Problem related to beta function, Gamma function, Double integral and Triple integral	

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PRINCIPAL
SOPHIA GIRLS' COLLEGE
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AJMER

Shivani
Head
Department of Mathematics
Sophia Girls' College
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B. Sc. II (SEMESTER IV) **Real Analysis (PAPER I) (MAT-401)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
December-January	**UNIT I** Real number system as a complete ordered field: Field and its properties, ordered field, lower bound, upper bound, supremum and infimum of sets, the completeness property of Real number system, the Archimedean property.	Application of Real number properties	Demonstration through examples on board, PPT to explain some theorems	Explain properties of the Real number $\mathbb{R}$ and nature of Real Sequences.	*Knowledge Based* - Define Archimedean ordered field - State D'Alembert's Ratio test. *Understanding Based* - A sequence $\{x_n\}$ is defined by $x_n = (n^2+1)/(2n^2+5)$ then check it is convergent or not - Test for uniform convergence the	Knowledge--50 Understanding-35 Higher Order-15
	Definition of sequence theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion.	Types of Sequence and their criteria for convergence	Lecture Method, Problem solving class, PDF notes, Recorded video lectures, Discussion of Previous year papers			

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February	**UNIT II** Infinite series of non-negative terms, different tests of convergence of infinite series comparison test, ratio test, Logarithmic, Morgen and Bertrand test (without proof).	Nature of infinite series and test to find their convergence	Demonstration through examples on board, Open book test	Apply the ratio, Leibnitz', Cauchy n^{th} root test for Convergence of an Infinite series of Real number.	sequence $\{f_n(x)\}$ where $f_n(x) = n x (1-x)^n$ when $0 \le x \le 1$ *Higher Order Thinking Skills Based* - Prove that every complete ordered field F is an Archimedean ordered field. - If a function f is a continuous on [a,b] then prove that it attains its supremum and infimum at least once in[a,b].
	Alternating series, Leibnitz' theorem Absolute and conditional convergence, Pointwise convergence of sequence of functions, Uniform convergence	Criteria for absolute and conditionally convergence	Lecture method, Problem solving class, PDF notes, Recorded videos lectures		
March-April	**UNIT III** Logarithmic function, exponential function and its standard properties (Covid - 19), Limit, continuity, differentiability of two variable functions.	Differentiability of two variable functions.	Demonstration through examples on board, PPT to explain some theorems,	Test Continuity and Differentiability of two variable function and the application of mean value Theorem. This paper will help in skill development in the field of Real Number and their Application.	
	Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Riemann integral, Fundamental theorem of integral calculus. **Revision Class**	Main theorems related to Mean value and Riemann integral	Demonstration through examples on board, Problem solving class, Recorded videos lectures, PDF notes		

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Department of Mathematics
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SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. II (SEMESTER IV) **Mechanics (PAPER II) (MAT-402)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
January	**UNIT I** General Conditions of equilibrium of coplanar forces: Reduction of coplanar forces into a force with couple, Equilibrium of a rigid body under three forces, Equilibrium of rigid body under more than three forces.	coplanar forces and their equilibrium conditions	Lecture Method, Problem solving class, PDF notes, PPT to explain some theoretical concepts	Explain necessary conditions for the equilibrium of Coplanar Forces and Application of Friction.	*Knowledge Based* - Write the formulae of resultant of two forces acting at a point. - Define common Centenary. *Understanding Based* - A ball impinges directly upon another ball at rest and is itself reduced to rest by impact. If half of	Knowledge-50 Understanding-35 Higher Order-15
	Friction, Common Catenary	Types of Friction and Application of uniform catenary	Recorded video lectures, Demonstration through examples on board, Open book test			

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February-March	**UNIT II** Kinematics and Kinetics Rectilinear motion, Velocity and acceleration along radial, transverse, tangential and normal directions, Simple harmonic motion. Rectilinear motion in resisting medium, Hook's law and related problem.	Different types of Motion, Problems of String	Lecture method, PPT, Group Discussion, PPT to explain Kinematics motion, PDF notes, Recorded video lectures	Deal with the Kinematics and Kinetics of the rectilinear motions of a particle, Problem related to horizontal and vertical elastic string.	the initial KE is destroyed in the collision, find the coefficient of restitution. - Explain Hooke's law for horizontal elastic strings and modulus of elasticity. - *Higher Order Thinking Skills Based* - If the central force varies inversely as the cube of the distance from the fixed point. Find the central orbit - In a triangle ABC , G be any point in the base BC, dividing it into two segments m and n. Prove that $(m+n)\cot\theta = m\cot\alpha - n\cot\beta$ If $\angle BAG = \alpha$ $\angle CAG = \beta$ $\angle AGC = \theta$	
April	**UNIT III** Constrained motion in vertical and horizontal circles, central orbit, inverse square law (Planetary motion), Impact (Direct and Oblique). **Revision Classes**	Constrained motion, Collision	Demonstration through examples on board, Problem solving class, PPT to explain the Oblique and Direct Impact	Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions.		

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

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Shivani
Head
Department of Mathematics
Sophia Girls' College
(Autonomous), Ajmer

SOPHIA GIRLS' COLLEGE (*AUTONOMOUS*), AJMER

B. Sc. III (SEMESTER VI) **Statistics (PAPER I) (MAT -601)**

Max. Marks: 100 (70 External; 30 Internal) Min. Marks: 40 (28 External; 12 Internal) Credit: 04

COURSE PLAN

SEM VI Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
December-January	**UNIT I** Random experiment, Sample space, Definition of Probability, Conditional probability, Addition theorem of probability, Multiplication theorem of compound probability, Baye's theorem.	Daily life examples of probability, Baye's Application	Demonstration through examples on board, Quiz related to probability	Apply several concepts of Probability, Application of Baye's theorem, Regression and Correlation Coefficient for solving real life situation.	*Knowledge Based* - Define mutually exclusive or disjoint events. - Write the relation between $Ma\,(t)$ and $Mo\,(t)$ *Understanding Based* - The probability that a teacher will give a unannounced test during any class meeting is 1/5 . If a student is absent twice, what is the	Knowledge--40 Understanding-35 Higher Order-25
	Random variate, Probability distribution, Mathematical expectation, Moment, Mathematical expectation of the Sum and product of two random variate, Covariance, Curve fitting, Regression and Correlation Coefficient.	Mathematical expectation, Regression and Correlation Coefficient	Lecture method, Problem solving class, PDF notes, Problem solving class			
	UNIT II Moment Generating Functions,	Relation between Moment Generating	Lecture Method, Open book test,	Explain Discrete		

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February-March	Theorems on moment generating function, Cumulants, Properties of Cumulants, Characteristic function.	Functions and Cumulants.	Recorded videos lectures, PPT to explain some theoretical part	probability distributions like Binomial and Poisson distribution.	probability that he will miss atleast one test? - Derive the median of the normal distribution. *Higher Order Thinking Skills Based* - An urn contain five balls. Two balls are drawn and are found to be white. What is the probability of all the balls being white. - Prove that for normal distribution, all the cumulates after the second are equals to zero.
	Discrete probability distributions: Binomial, Poisson distribution and their Mean, Variance, Moment, Recurrence relation, Moment generating function.	Various properties of Binomial and Poisson distribution	Demonstration through examples on board, Problem solving class		
April	**UNIT III** Continuous probability distribution: Rectangular distribution, Normal distribution, derivation of normal distribution from binomial distribution, Mean, Variance, Moment, Recurrence relation, Moment generating function, Additive property of normal distribution, Problems related to area property of normal distribution, Exponential Distribution.(Case study related to COVID 19 based on Exponential Distribution) **Revision Classes**	Application of Normal Distribution	Demonstration through examples on board, PPT to explain some theoretical part, Problem solving class, Recorded video lectures	Solve Problems related to Rectangular Distribution and area property of normal distribution. This paper will help in skill development in the field of Probability and its Applications.	

Dr. Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Head
Department of Mathematics
Sophia Girls' College
(Autonomous), Ajmer