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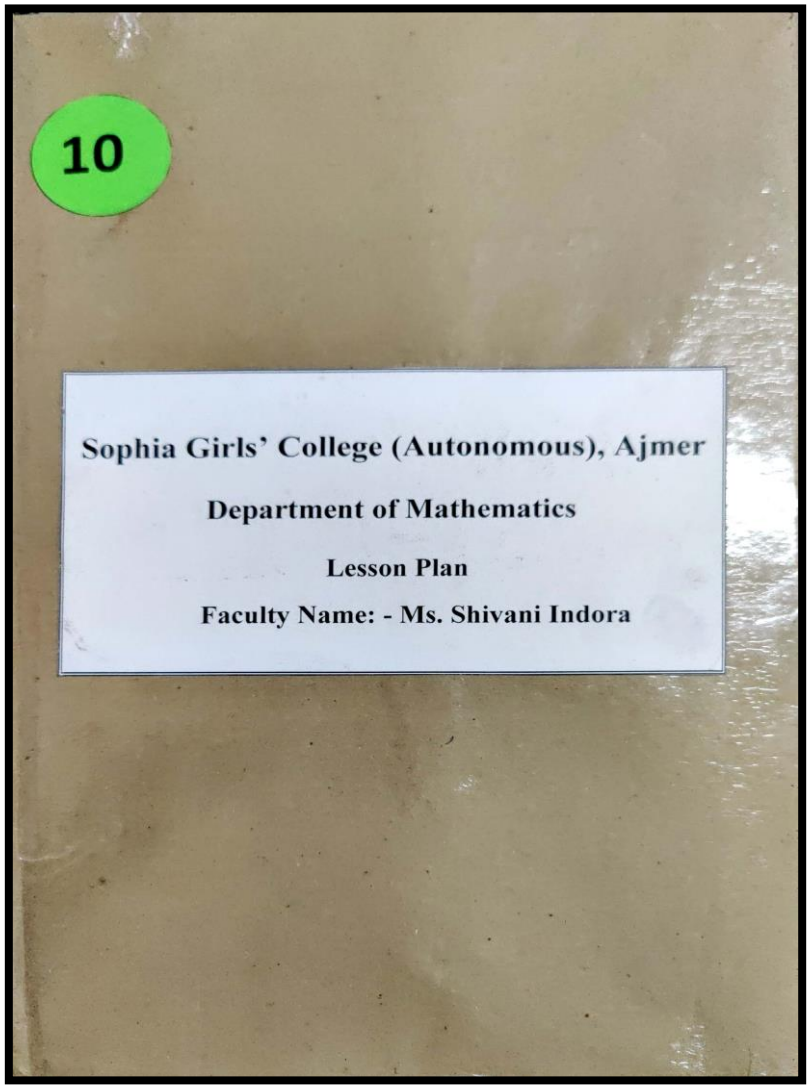

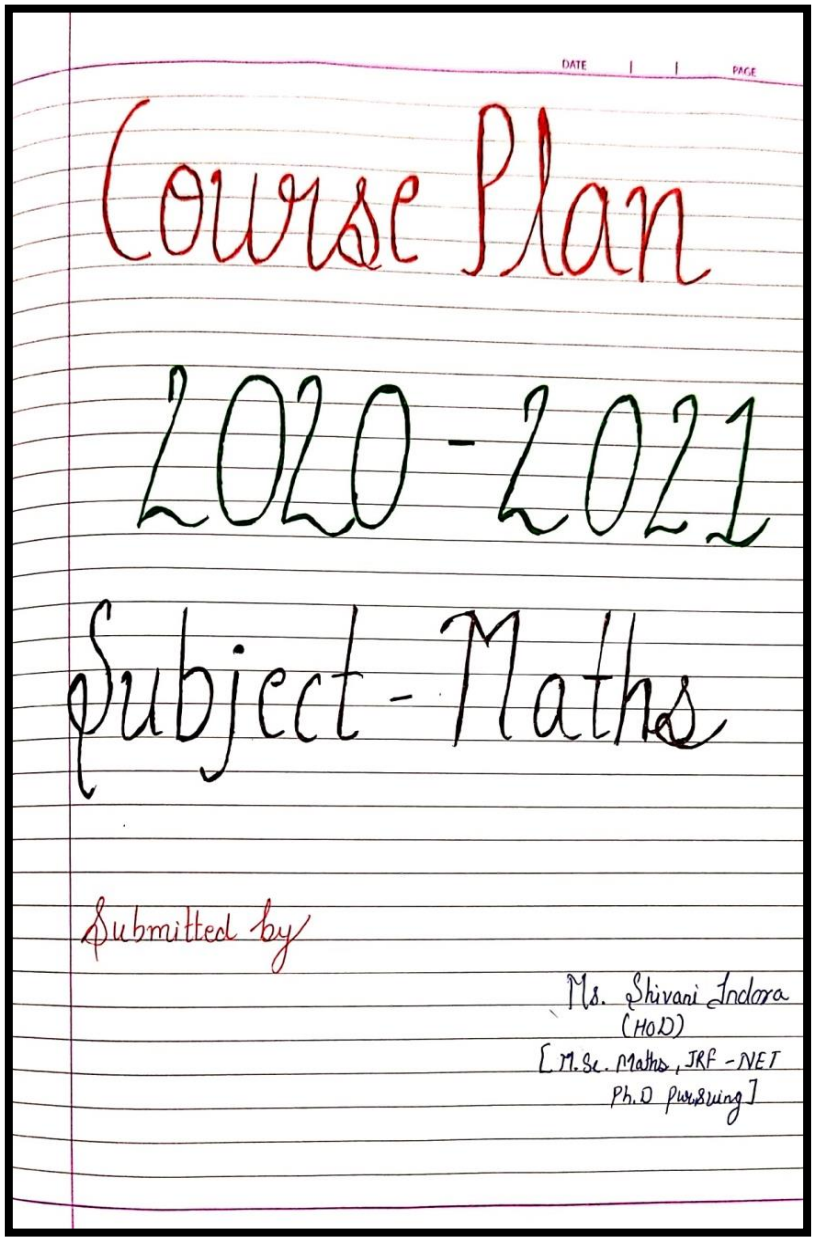
DATE / / PAGE
Course Plan
2020-2021
Subject - Maths
Submitted by
Ms. Shivani Indora
(HOD)
[M.Sc. Maths, JRF - NET
Ph.D pursuing]

SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

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-September	**UNIT I** Matrix, Types of matrix, Elementary operations on matrices, Symmetric and Skew Symmetric matrices, Hermitian and Skew Hermitian matrices, unitary matrix.	Matrix	Lecture method, Brainstorming	Identify types of Matrix, its rank by using Normal form and Echelon form method and nature of vectors.	*Knowledge Based* -What do you mean by orthogonal matrix ? -Define Row and Column rank of matrix? *Understanding Based* -List four properties of an Eigen Value? -Show that A satisfies Cayley Hamilton theorem.	Knowledge--60 Understanding-30 Higher Order-10
	Inverse of matrix, Linear Independence of row and column matrices.	Linear combination of vectors	Demonstration through examples,			
	Row rank, Column rank and Rank of matrix, Equivalence of column and row rank.	Rank of a matrix	Demonstration through examples, Problem solving classs			

October-November	**UNIT II** Applications of matrices to solve a system of linear (both homogeneous and non- homogenous) equations, Theorems on consistency of a system of linear equation	Homogeneous and non-Homogeneous system of equation	Online Group Discussion, Demonstration through examples, Quiz	Solve System of Linear Equation by Matrix method, Problems related to Eigen value and Eigen vector.	$A = \begin{bmatrix} 2 & 6 \\ 0 & 1 \end{bmatrix}$ *Higher Order Thinking Skills Based* - Evaluate roots of the equation $x^3 - 15x - 126 = 0$ By Cardan's method. $A = \begin{bmatrix} 1 & 4 \\ 4 & 2 \end{bmatrix}$ -State and Prove the Cayley Hamilton theorem.	
	Eigen values, Eigen vectors and the Characteristic equation of a matrix, Cayley - Hamilton theorem and its use in finding Inverse of a matrix.	Cayley - Hamilton theorem	Demonstration through examples, Problem solving classs			
January - February	**UNIT III** Relation between roots and coefficients of general polynomial equation in one variable Transformation of equations.	General properties of polynomial equation	Lecture Method, Quiz	Evaluate roots of Cubic equation by Cardan's method and Biquadratic equations by Ferrari's method.		
	Descartes' rule of signs, Solution of cubic equation by Cardan's method, Solution of Biquadratic equations by Ferrari's method. **REVISION CLASSES**	Solution of cubic and Biquadratic equation.	Demonstration through examples, Problem solving class			

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

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

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SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

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 (%)
September-October	**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, Quiz	Explain Groups, general properties of groups and Application of Lagrange's theorem.	*Knowledge Based* -State Lagrange's Theorem. -Define Cyclic Group? *Understanding Based* -Sow that H is a normal subgroup iff Ha = aH. -Compare Subgroup and Normal Subgroup properties.	Knowledge--60 Understanding-30 Higher Order-10
	Subgroup, Generation of groups, Cyclic group, cosets decomposition, Lagrange's theorem and its consequences.	Subgroups	Lecture method, Problem solving class			
December-January	**UNIT II** Normal subgroups and Quotient groups,Permutation,	Normal subgroup and its properties ,Permutation group	Lecture method , Brainstorming	Analyze Normal subgroups,		

	permutation group, cyclic permutation, Even and Odd permutation, The alternating group A_n.			Quotient group, Permutation group and Morphism of group.	*Higher Order Thinking Skills Based* - Prepare an Operation table for $G = \{0,1,2,3; +_4\}$ Also find (a) Order of every element. (b) Check the group is cyclic or not. -Prove that the normaliser N(a) = $\{x \in G: ax = xa\}$ is a subgroup of G, a is an element of a group G.	
	Morphism of groups, Homomorphism and isomorphism, The fundamental theorem of homomorphism.	Group Morphism	Lecture method, Problem solving class			
February	**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 their Subrings	Demonstration through Examples	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**	Ideals	Demonstration through examples.			

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

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

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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	PPT, Demonstration through theorems	Explain the concepts of vector spaces, subspaces, basis, dimension and their properties.	*Knowledge Based* -What do you mean by Diagonalization? - Define Linear Combinations of vectors. *Understanding Based* - Show that the set $W = \{(a, b, c): a - 3b + 4c = 0; a, b, c \in R\}$ of 3-tuples is a subspace of the vector space $V_3(R)$.	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	Demonstration through examples and theorems , Problem solving class			

September	**UNIT III** Eigen values and Eigen vectors, similar matrices, equivalent matrices, minimal polynomial.	Properties of Eigen value of matrix A	Quiz, Demonstration through examples	Compute Eigen values and Eigen vectors, minimal polynomial, Jordan Canonical of Matrix.	-Apply Cayley – Hamilton theorem to find A^{-2} $\begin{bmatrix} 4 & 0 \\ 1 & -1 \end{bmatrix}$ *Higher Order Thinking Skills Based* - Prove that Similar matrices have the same characteristic polynomial. -Evaluate the Eigen values of the following matrix A find their corresponding Eigen vector $A = \begin{bmatrix} 2 & 0 & 0 \\ 3 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$
	Diagonalization of matrices, Jordan blocks and Jordan forms.	Diagonalizable matrix	Demonstration through examples, Problem solving class		
November-December	**UNIT II** Homomorphism and isomorphism of vector space, theorems on space morphism, Rank and Nullity, Sylvester law of nullity, Algebra of linear transformation.	Homomorphism of Vector space	PPT, Demonstration through examples and theorems	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**	Matrix of Linear transformation	Demonstration through examples, Problem solving class		

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

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

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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 of first order and first degree.	Demonstration through examples, Quiz	Formulate the ordinary the Ordinary differential equation and solve Differential equations of first order and first degree.	*Knowledge Based* -Write the standard form of Bernoulli's Equation. -What is singular Solution? *Understanding Based* -Solve : $p\,q = \frac{ax}{y}$ - Apply Charpit's formula to sovle the partial differential equation $p\,x + q\,y = p\,q$	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.	Differential equations of first order and higher degree.	Demonstration through examples, Problem solving class			

September	**UNIT III** Partial differential equation: Formation, order and degree, linear and non-linear partial differential equation of first order. Complete 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	Solution of linear and non-linear partial differential equation of first order.	Demonstration through examples, Quiz	Solve non-linear Partial differential equation by Charpit's method, Homogeneous and non-Homogeneous linear partial differential equation with constant coefficients.	*Higher Order Thinking Skills Based* - Evaluate the solution of given differential equation $pq = x^m y^n z^{2l}$ -Formulate differential equation of the following family of curves: $y = ax + by + c$	
	Homogeneous and non-Homogeneous linear partial differential equation with constant coefficients, Partial differential equation with variable coefficients redu cible to equations with constant coefficients,their complimentary function and particular integrals.	Partial differential equation with constant and variable coefficients	Online Group discussion, Demonstration through examples, Problem solving class			
December	**UNIT II** Linear differential equations	Linear differential equations with constant	Demonstration through	Learn various techniques of		

	with constant coefficients: Homogeneous and non-homogeneous linear ordinary differential equation, Geometrical meaning of a differential equation and orthogonal trajectories.	coefficients.	examples, Quiz	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 d x / P = d y / Q = d z / R. **REVISION CLASSES**	Linear differential equation of second order.	Demonstration through examples, Problem solving class			

Sr. Pearl

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

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

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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 I** Definition and examples of a metric space, Diameter of a set, Bounded set, Open sphere, Closed sphere, Open set, Properties of open set .	Metric space and Open set	Demonstration through examples and theorems	Explain several standard concepts of Metric space and their properties, Open and Closed sets.	*Knowledge Based* -Write necessary condition for an analytic function? -Define an Open set? *Understanding Based* -Show that every closed sphere is a closed set. -Test $\lim_{z \to z_0} \left(\frac{z}{\bar{z}}\right)$ exist or not .	Knowledge--40 Understanding-35 Higher Order-25
	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.	Limit Point and Closed set	Quiz, Demonstration through theorems, Problem solving class			
September-October	**UNIT II** Continuity and Differentiability of complex valued function,	Differentiability of complex valued function	Demonstration through examples, Quiz			

	Analytic function, Necessary and Sufficient condition for analytic function, Cauchy – Riemann Equations (Cartesian and Polar form)			Analyze Analyticity of function and Construct analytic function by Milne Thomson method.	*Higher Order Thinking Skills Based* -Evaluate f (z) in terms of z, if f (z) = u+iv is an analytic function and u – v = $e^x(cosy - siny)$. -Prove that : (a)The empty set Ø and the full space X are closed sets. (b)The union of a finite family of closed sets is closed.
	Harmonic function, Conjugate Harmonic function, Construction of an analytic function by Milne Thomson method.	Analytic Functions	Online Group Discussion, Demonstration through examples, Problem solving class		
November-December	**UNIT III** Conformal mapping, Isogonal mapping, Necessary and sufficient conditions for a conformal mapping. Some elementary transformations: Translation, Rotation, Magnification, Inversion.	Conformal mapping	Demonstration through examples, Brainstorming	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, Problem solving class		

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

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(Autonomous), Ajmer

SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)
B. Sc. III (SEMESTER V)
LINEAR PROGRAMMING (PAPER II) (MAT -502)

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.	Graphical approach to solve LPP	Demonstration through examples, Brainstorming	Explain several standard concepts of Metric space and their properties, Open and Closed sets.	*Knowledge Based* -What do you mean by slack and surplus variable? - Write main components of linear programming problem. *Understanding Based* - Show that the following set S = {(1, 0), (1, 1)} is L.I.	Knowledge--40 Understanding-35 Higher Order-25
	Basic Feasible solution, Optimal solution, Convex set and their properties, Hyperplane, Basic solutions and properties.	Convex set and its properties	Online Group discussion, Demonstration through examples, Problem Solving class			
July	**UNIT II** Theory of Simplex method, Fundamental Theorem of	Simplex method to solve LPP	Demonstration through examples			

	Linear Programming (Statement only), The Simplex algorithm, Simplex method in tableau format.			Analyze Analyticity of function and Construct analytic function by Milne Thomson method.	- Solve the following L.P.P. by graphical method $Max\, z = 2x + y$ s.t. $x + y \leq 4$ $x + y \leq 6$ $x \leq 3$ and $x \geq 0,\ y \geq 0$	
	introduction to artificial variables, case of unbounded solutions, Big- M method, Two phase method, Degeneracy in linear programming problem.	Degeneracy in linear programming problem	Demonstration through examples, Online Group discussion, Problem solving class			
October-November	**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 relationships	Demonstration through examples, 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.	*Higher Order Thinking Skills Based* -Evaluate max z of the following L.P.P. by simplex method. $Max\, z = 2x_1 + x_2$ s.t. $3x_1 + 5x_2 \leq 15$ $6x_1 + 2x_2 \leq 24$ and	
	Revised Simplex method (standard form I and II). **REVISION CLASSES**	Revised Simplex method	Demonstration through examples, Problem solving class			

					$x_1, x_2 \geq 0$ -Prove that every hyper plane is a convex set and intersection of two convex set is again a convex set.	

Sr. Pearl

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

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

SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

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 (%)
April	**UNIT I** Vector differentiation, Gradient, Divergence and Curl, Identities involving these operators and related problems.	Vector differentiation	Lecture method, Brainstorming	Evaluate vector Differentiation , gradient, divergence, curl, line integral and surface integral.	*Knowledge Based* - What do you mean by gradient of scalar point function ? - Define Cylinder. *Understanding Based* - Compute equation of conic section in its simplest form. - Show that grad (f +g) = grad f + grad g	Knowledge--60 Understanding-30 Higher Order-10
	Vector integration, Line and surface integral, Theorem of Gauss, Green's and Stoke's.	Vector integration	Audio Lectures, problem solving class, Test			
May - June	**UNIT II** General equation of second degree, Tracing of conics, centre of a conic, coordinates of the centre. Equation of the conic referred to centre as	Tracing of Ellipse, Parabola and Hyperbola.	Lecture Method, Quiz,	Design		

	origin, Asymptotes of a conic, Length and position of axes of a standard conic, Tracing of Ellipse, Parabola and Hyperbola.			different types of conic like Ellipse, Parabola and Hyperbola in Cartesian coordinate.	Where f and g are scalar point functions . *Higher Order Thinking Skills Based* - Evaluate the Co-ordinates of the centre of the conic: $36x^2 + 20xy + 40y^2 - 12x + 15y + 81 = 0$ - Evaluate integral of $xy\,dx + xy^2\,dy$, where curve is a square in xy plane whose vertices is (1,0),(-1,0),(0,1) and (0,-1)	
	The Polar equation of Conic: polar equation of a straight line, circle and conic chord, Auxiliary circle, Tracing of conic l/r = 1+ecosθ.	Tracing of conic l/r = 1+ecosθ.	Lecture method, Problem solving class, Test			
	UNIT III Sphere, Plane section of a sphere, tangent line and tangent plane of sphere.	Properties of Sphere	Lecture Method, Quiz, PPT	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 Dand 3 D Geometry		
	Cone, Enveloping cone, Tangent plane of cone, Reciprocal cone.	Properties of Cone	Lecture Method, Problem solving class, PPT			
	Cylinder, Right circular cylinder, enveloping cylinder. **Revision Class**	Properties of Cylinder	Lecture method, Problem solving class			

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

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

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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 (%)
April	**UNIT III** Beta and Gamma function, Double integral, change of order of integration.	Deal with the property of beta function, gamma function and double integral	Audio lecture, Brainstorming	Solve Problem related to beta function, Gamma function, Double integral and Triple integral	*Knowledge Based* - Define Envelopes. - State Dirichlet's Integral. *Understanding Based* - Find the extreme value of the function: $x^3 + y^3 - 3axy$ - Show that B (m,n) = B (n,m) *Higher Order Thinking Skills Based* -Evaluate the	Knowledge--60 Understanding-30 Higher Order-10
	Triple integral, Dirichlet's integral and Liouville's extension of dirichlet's integral (statement only).	Triple integral property	Lecture method, Problem solving class			
May	**UNIT I** Partial Differentiation, Change of variables, Euler's theorem on homogeneous functions, Differentiation of implicit functions, Jacobians	Partial Differentiation	Lecture method, Online Group Discussion	Evaluate Maxima, Minima and saddle points of function of		

	Envelopes, Evolutes, Maxima, Minima and saddle points of function of two variables.	Maxima and Minima	Lecture method, Problem solving class, Test	two variables.	asymptotes of the following curve. $x^3 + 2x^2y$ $-xy^2 - 2y^3$ $+xy - y^2 = 1$ -Evaluate $\iiint z\,dxdydz$ Where region of integration is cylinder V bounded by the following curves z=0 , z = 1 and $x^2 + y^2 = 4$	
	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 Tests for concavity and convexity, test for point of inflexion, singular points, curve tracing(in Cartesian and polar co-ordinates). **Revision Class**	Asymptote in Cartesian coordinate and curvature Curve tracing in Cartesian and polar coordinate	Online Group discussion , Problem solving class	Sketch curves in Cartesian and polar coordinate systems.		

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

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

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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 (%)
April	**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.	properties of the Real number system	PPT, Lecture method, Brain Storming	Explain properties of the Real number $\mathbb{R}$ and nature of Real Sequences.	*Knowledge Based* - State Archimedean property. -What do you mean by Cauchy's convergence criterion? *Understanding Based* -Show that the sequence $< x_n >$ converges to '1'. Where $x_1 = \frac{1}{2}$ and	Knowledge--50 Understanding-35 Higher Order-15
	Definition of sequence theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion.	Convergence criteria of sequence.	Lecture Method, Problem solving class			
April and June	**UNIT II**		Online Group Discussion, Quiz	Apply the ratio,		

	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		Leibnitz', Cauchy n^{th} root test for Convergence of an Infinite series of Real number.	$x_{n+1} = \frac{2x_n+1}{3}$ -Test whether the series $\sum sin\frac{1}{n}$ is convergent or divergent . *Higher Order Thinking Skills Based* - Evaluate the value of Θ for the function $f(x)= ax^2 + bx + c$ in the following form of Lagrange's mean value theorem $f(x+h) = f(x) + hf'(x+\Theta h)$, $0 < \theta < 1$ - Prove Fundamental theorem of integral calculus.
	Alternating series, Leibnitz' theorem Absolute and conditional convergence, Pointwise convergence of sequence of functions, Uniform convergence	Nature of alternating series, Uniform convergence	Lecture method, Problem solving class, Test		
	UNIT III Logarithmic function, exponential function and its standard properties (Covid - 19), Limit, continuity, differentiability of two variable functions.	Limit, continuity, differentiability test.	PPT, Lecture method	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**	Mean value theorems and , Riemann integral	Lecture method, Problem solving class, Test		

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

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

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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 (%)
May	**UNIT II** Kinematics and Kinetics Rectilinear motion, Velocity and acceleration along radial, transverse, tangential and normal directions, Simple harmonic motion.	Kinematics and Rectilinear motion	Lecture method, PPT, Group Discussion	Deal with the Kinematics and Kinetics of the rectilinear motions of a particle, Problem related to horizontal and vertical elastic string.	*Knowledge Based* - State Hook's law. - What do you mean by constrained motion? *Understanding Based* - Show that if the displacement of a particle moving in a straight line is expressed by the equation x = a cosnt + bsin nt , it describes S.H.M.	Knowledge--50 Understanding-35 Higher Order-15
	Rectilinear motion in resisting medium, Hook's law and related problem.	resisting medium and string related problems.	Lecture Method, Problem solving class			

May - June	**UNIT III** Constrained motion in vertical and horizontal circles, central orbit, inverse square law (Planetary motion), Impact (Direct and Oblique).	Constrained motion and Direct and Oblique impact	Lecture Method, Group discussion, Problem solving class	Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions.	Whose amplitude is $(a^2+b^2)^{1/2}$ and period $2\pi/n$. - Distinguish between direct impact and Oblique impact. - *Higher Order Thinking Skills Based* - Evaluate the force towards the pole when a particle describes the curve $r = a\sin n\Theta$ -Prove that the least eccentricity of the ellipse which can rest on the plane is $(2\sin\alpha/(1+\sin\alpha))^{1/2}$, If a perfectly rough plane is inclined at an angle α to the horizon.	
	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.Friction, Common Catenary **Revision Class**	Equilibrium of coplanar forces Friction and Catenary problem	Lecture Method, Problem solving class	Explain necessary conditions for the equilibrium of Coplanar Forces and Application of Friction.		

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

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

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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 (%)
April	**UNIT I** Random experiment, Sample space, Definition of Probability, Conditional probability, Addition theorem of probability, Multiplication theorem of compound probability, Baye's theorem.	Probability	Lecture Method and , Quiz	Apply several concepts of Probability, Application of Baye's theorem, Regression and Correlation Coefficient for solving real life situation.	*Knowledge Based* - State Baye's theorem. - What do you mean by Mathematical expectation? *Understanding Based* - Show that mean of binomial distribution is np. - Explain two properties of Normal Distribution. *Higher Order Thinking Skills Based*	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			
	UNIT II			Explain Discrete		

May	Moment Generating Functions, Theorems on moment generating function, Cumulants, Properties of Cumulants, Characteristic function.	Moment Generating Functions and Cumulants.	Lecture Method, Quiz	probability distributions like Binomial and Poisson distribution.	- Evaluate first four moment about origin of Poisson distribution. -Prove that the rth moment about origin of the binomial distribution b(x,n,p) is given by: $\mu'_r = \left(p\frac{\partial}{\partial p}\right)^r$ $(p+q)^n$	
	Discrete probability distributions: Binomial, Poisson distribution and their Mean, Variance, Moment, Recurrence relation, Moment generating function.	Binomial and Poisson distribution	Group Discussion, Lecture Method, Problem solving class			
May - June	**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.	Normal distribution	Lecture Method, PPT, Problem solving class, Test	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.		

	(Case study related to COVID 19 based on Exponential Distribution) **Revision Class**					

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

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

SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

B. Sc. III (SEMESTER VI) **NUMERICAL ANALYSIS (PAPER II) (MAT -602)**

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 (%)
March	**UNIT I** Numerical operators, Properties of operators, Fundamental theorem of difference calculus, Factorial function.	Properties of Numerical operators	Lecture Method, PDF Notes	Learn about various Numerical operators, interpolating and extrapolating methods.	*Knowledge Based* - What do you mean by Factorial function. - State fundamental theorem of difference calculus. *Understanding Based* - Calculate the root of the equation $X^3 - 9x + 1 = 0$ between x = 2 and x = 4 by the method of bijection.	Knowledge--40 Understanding-35 Higher Order-25
	Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formula.	Interpolation with equal intervals	Group discussion, Lecture Method , Problem Solving class			
April	**UNIT II** Divided differences and their properties, Newton's formula for unequal intervals, Lagrange's formula, Central difference, Gauss forward and backward	Interpolation with unequal intervals	Lecture Method, PPT	Solve question related to unequal intervals by using Newton's		

	formula, Stirling interpolation formula Bessel formula.			formula, Lagrange's formula.	-Show that f(a,b,c) = $\frac{-(abc+bcd+acd+abd)}{a^2b^2c^2d^2}$ If f(x) = $1/x^2$. *Higher Order Thinking Skills Based*
	Numerical Differentation: Derivative from interpolation formulae, approximate expressions for the derivatives of a function.	Numerical Differentation	Lecture Method, Group discussion, Problem solving class, PPT		
July	**UNIT III** Numerical Integration: General quadrature formula for equidistant ordinates, Trapezoidal, Simpson's one-third, three-eighth rule, Weddle's rule, Gauss' Quadrature formula, Euler – McLaurin's summation formula	Numerical Integration	Lecture method, PPT	Evaluate Numerical Integration by General quadrature formula,Trapezoidal, Simpson's one- third, three-eighth rule.	-Prove that the nth divided differences of a polynomial of the nth degree are constant. - Evaluate $\int_0^1 \frac{dx}{1+x^2}$ By using simpson's 1/3 rule.
	Solution of algebraic and transcendental equation, Newton Rapson method and Regular Falsi method. **Revision Class**	Solution of algebraic and transcendental equation	Demonstration through examples, Problem solving class, PPT	This paper will help in skill development in the field of Research related to Operators.	

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Head
Department of Mathematics
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(Autonomous), Ajmer