

## Lesson Plan (Session 2024-25 (Odd Semester))

(July 2024 to November 2024)

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Functions and Algebra**

**Class : B.Sc. 1<sup>st</sup> Sem( Non-Medical)**

Month	Topics to be covered	Assignment/ Test
July	Relations, Functions along with domain and range, Composition of functions, Invertibility and inverse of functions, One-to-one correspondence and the cardinality of a set.	
August	Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations. Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.	Assignment – I
September	<b>Matrix and its types.</b> Symmetric, Skew-symmetric, Hermitian and Skew Hermitian matrices. Unitary and Orthogonal Matrices, Idempotent, Involuntary, Nilpotent Matrices.  <b>Rank of a Matrix &amp; its applications.</b> Rank of a matrices, Row rank and column rank of a matrix, Elementary Operations on matrices, Inverse of a matrix , Normal Form, PAQ Form, Linear dependence and independence of rows and columns of matrices , Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations, Theorems on consistency of a system of linear equations.	Test Unit -I
October	<b>Rank of a Matrix &amp; its applications.</b> Rank of a matrices, Row rank and column rank of a matrix, Elementary Operations on matrices, Inverse of a matrix , Normal Form, PAQ Form, Linear dependence and independence of rows and columns of matrices , Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations, Theorems on consistency of a system of linear equations.	Assignment – II
November	<b>Cayley Hamilton theorem.</b> Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix. Diagonalization of matrix.	Test Unit II

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## Lesson Plan (Session 2024-25 (Odd Semester))

(July 2024 to November 2024)

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Practical on course Functions and Algebra**

**Class : B.Sc. 1<sup>st</sup> Sem**

Month	Topics to be covered	Assignment/ Test
July	1. Matrix operations (addition, multiplication, inverse, transpose, determinant, rank, eigenvectors, eigenvalues, Characteristic equation and verification of Cayley Hamilton equation, system of linear equations )	
August	1. Practical based on System of Homogenous Equation and application to solve balance chemical equation. 2. Practical based on System of Non- Homogenous Equation and applications to solve network flow problems, Nutrition and Economic Input-Output Models. 3. Problems based Markov process a type of Mathematical Modeling .	Assignment – I
September	1. Applications and Uses of Matrix in Coding theory. 2. Study of reflection, shear, dilation, contraction of figure using matrix transformation as application of computer graphics. 3. Application of System of Equations to Solve Electric Circuits. 4. Applications of Eigen values to solve a Diffusion Process and Dynamical Systems. 5. Plotting of graphs of following functions (i) $y = \frac{a^n}{x^n}$ , Rational function (ii) $f(x) = \frac{1}{x^n}$ Irrational function (iii) $f(x) = x^{1/n}$ where $n \in N$ (discuss both cases on n is even or odd) (iv) Piecewise Function (Modulus function, Signum function, Greatest integer function, Fractional part function, Least integer function).	Test Unit -I
October	1. Plotting of graphs of following transcendental and standard functions (i) Sin(x), Cos(x), Tan(x), Cot(x), Sec(x), Cosec(x), $e^x$ , $a^x$ ( $a > 1, a < 1$ ), $\log_a(x)$ ( $a > 1, a < 1$ ) and Standard Geometrical functions (i)	Assignment – II

	<p style="text-align: center;">Straight Line (ii) Circle (iii) Parabola (iv) Ellipse (v) Hyperbola.</p> <p>2. (i) Plotting of graphs of six inverse trigonometric functions and hyperbolic functions (ii) Solution of Transcendental equation using graph for example <math>\sin x = \frac{x}{10}</math>, <math>\cos(x)=x</math> (iii) Plotting of graphs of functions <math>\sin^{-1}(\sin x)</math>, <math>\sin(\sin^{-1}x)</math>.</p> <p>Study of various graphical transformations by which <math>f(x)</math> transform to <math>f(x) \mp a</math>, <math>f(x \mp a)</math>, <math>af(x)</math>, <math>f(ax)</math>, <math> f(x) </math>, <math>f( x )</math>, <math> f( x ) </math>, <math> y  = f(x)</math>, <math> y  =  f(x) </math>, <math> y  =  f( x ) </math>, <math>y = [f(x)]</math>, <math>y = f([x])</math>, <math>y = [f([x])]</math>.</p>	
<b>November</b>	Revision	<b>Test Unit II</b>

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**Lesson Plan (Session 2024-25 (Odd Semester))**

**(July 2024 to November 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Advanced Calculus**

**Class : B.Sc. 3<sup>rd</sup> Sem**

<b>Month</b>	<b>Topics to be covered</b>	<b>Assignment/ Test</b>
<b>July</b>	Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity,	
<b>August</b>	Chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.	<b>Assignment – I</b>
<b>September</b>	Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.	<b>Test Unit -I</b>
<b>October</b>	Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.	<b>Assignment – II</b>
<b>November</b>	Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involutives, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.	<b>Test Unit II</b>

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**Lesson Plan (Session 2024-25 (Odd Semester))**

**(July 2024 to November 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Real Analysis**

**Class : B.Sc. 5<sup>th</sup> Sem**

<b>Month</b>	<b>Topics to be covered</b>	<b>Assignment/ Test</b>
<b>July</b>	Riemann integral	
<b>August</b>	Integrability of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.	<b>Assignment – I</b>
<b>September</b>	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.	<b>Test Unit -I</b>
<b>October</b>	Definition and examples of metric spaces, neighbourhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle	<b>Assignment – II</b>
<b>November</b>	Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness, components, continuity in relation with connectedness.	<b>Test Unit II</b>

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**Lesson Plan (Session 2024-25 (Odd Semester))**

**(July 2024 to November 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Multidisciplinary Course in Mathematics**

**Class : B.A. 1<sup>st</sup> Sem**

<b>Month</b>	<b>Topics to be covered</b>	<b>Assignment/ Test</b>
<b>July</b>	Numbers, H.C.F. and L.C.M. of Numbers,	
<b>August</b>	Decimal and Fractions, Simplification, Square roots and cube roots, Surds and indices.	<b>Assignment – I</b>
<b>September</b>	Problems on numbers, Average, Percentage, Profit and Loss, Ratio and proportion.	<b>Test Unit -I</b>
<b>October</b>	Problem on ages, Partnership, Time and work, Time and distance.	<b>Assignment – II</b>
<b>November</b>	Problems on trains, Mixture problem, Problems based on Calendar and clock.	<b>Test Unit II</b>

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