**Lesson Plan (Session 2023-24 (Odd Semester))**

**(July 21, 2023 to November 24, 2023)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Algebra**

**Class : B.Sc. 1st Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **July** | Matrices, Rank of a matrices. Inverse of a matrix.  Linear dependence and independence of matrices. |  |
| **August** | Row rank and column rank of a matrix. 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. Applications of matrices to a system of linear eqns. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices. | **Assignment – I** |
| **September** | Bilinear and Quadratic forms. Relations between the roots and coefficients of general polynomial equation in one variable. | **Test Unit -I** |
| **October** | Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. | **Assignment – II** |
| **November** | Transformation of equations. Nature of the roots of an equation Descarte’s rule of signs. Solutions of cubic equations . Biquadratic equations and their solutions. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Odd Semester))**

**(July 21, 2023 to November 24, 2023)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Advanced Calculus**

**Class : B.Sc. 3rd Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **July** | Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, |  |
| **August** | 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. | **Assignment – I** |
| **September** | 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. | **Test Unit -I** |
| **October** | 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. | **Assignment – II** |
| **November** | Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Odd Semester))**

**(July 21, 2023 to November 24, 2023)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Real Analysis**

**Class : B.Sc. 5th Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **July** | Riemann integral |  |
| **August** | Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus. | **Assignment – I** |
| **September** | 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. | **Test Unit -I** |
| **October** | 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 | **Assignment – II** |
| **November** | 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. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Odd Semester))**

**(July 21, 2023 to November 24, 2023)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Business Mathematics-I**

**Class : B.Com 1st Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **July** | Indices |  |
| **August** | Logarithms, Elementary idea of Permutations and Combinations | **Assignment – I** |
| **September** | Sequence and Series, A.P, G.P | **Test Unit -I** |
| **October** | Data interpretation- Introduction, approaches to data interpretation, tabulation, Bar graphs, Pie charts, Line graphs, Mix graphs | **Assignment – II** |
| **November** | Theory of Sets: Meaning, elements, types, presentation and equality of Sets, Union, Intersection, Complement and Difference of Sets, Venn Diagram, Cartesian Product of two Sets, Applications of Set Theory | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Even Semester))**

**(January 1, 2024 to April 30, 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Number Theory and Trigonometry**

**Class : B.Sc 1st year 2nd Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **January** | Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple)  Primes, Fundamental Theorem of Arithemetic. Linear Congruences, Fermat’s theorem. Wilson’s theorem and its converse. Linear Diophanatine equations in two variables. | **Assignment – I** |
| **February** | Complete residue system and reduced residue system modulo m. Euler’s ø function Euler’s generalization of Fermat’s theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function [x]. | **Test Unit -I** |
| **March** | The number of divisors and the sum of divisors of a natural number n (The functions d(n) and (n)). Moebius function and Moebius inversion formula.  De Moivre’s Theorem and its Applications. Expansion of trigonometrical functions. | **Assignment – II** |
| **April** | Direct circular and hyperbolic functions and their properties.  Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory’s series. Summation of Trigonometry series. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Even Semester))**

**(January 1, 2024 to April 30, 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Sequences and Series**

**Class : B.Sc 2nd year 4th Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **January** | Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem. | **Assignment – I** |
| **February** | Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy’s sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits.  Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy’s general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series. | **Test Unit -I** |
| **March** | Infinite series: D-Alembert’s ratio test, Raabe’s test, Logarithmic test, de Morgan and Bertrand’s test, Cauchy’s Nth root test, Gauss Test, Cauchy’s integral test, Cauchy’s condensation test. | **Assignment – II** |
| **April** | Alternating series, Leibnitz’s test, absolute and conditional convergence, Arbitrary series: Abel’s lemma, Abel’s test, Dirichlet’s test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet’s theorem, Riemann’s Re-arrangement theorem, Pringsheim’s theorem (statement only), Multiplication of series, Cauchy product of series, (definitions and examples only) Convergence and absolute convergence of infinite products. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Even Semester))**

**(January 1, 2024 to April 30, 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Real and Complex Analysis**

**Class : B.Sc 3rd year 6th Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **January** | Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals. | **Assignment – I** |
| **February** | Fourier’s series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co- efficients, Dirichlet’s conditions, Parseval’s identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals. | **Test Unit -I** |
| **March** | Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions. | **Assignment – II** |
| **April** | Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed pints, Cross ratio, Inverse Points and critical mappings. | **Test Unit II** |

**Signature:**

**Lesson Plan (Session 2023-24 (Even Semester))**

**(January 1, 2024 to April 30, 2024)**

**Name: Dr. Dharmvir Singh Vashisth**

**Department: Mathematics**

**Subject: Business Mathematics-II**

**Class : B.Com 1st year 2nd Sem**

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| **Month** | **Topics to be covered** | **Assignment/ Test** |
| **January** | Definition of a Matrix ; Types of Matrices, Algebra of Matrices. Calculation of values of Determinants up to third order; adjoint of a Matrix, elementary row and column operations; Finding inverse matrix through adjoint and elementary row or column operations; Solution of a system of Linear equations having unique Solution and involving not more than three variables | **Assignment – I** |
| **February** | Differentiation (only algebraic problem) ; Application of differentiation , Compound Interest and Annuities: Certain different types of interest rate. | **Test Unit -I** |
| **March** | Concept of present value and amount of a sum; Types of annuities; Present value and amount of an annuity, including the case of continuous compounding | **Assignment – II** |
| **April** | Ratio, Proportion and Percentage; Profit and Loss. | **Test Unit II** |

**Signature:**