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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 1st  |
| Subject | Algebra | Session | 2023-2024 |

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| Week | Topics |
| **1** | Symmetric, Skew Symmetric, Hermitian and Skew Hermitian Matrices, Elementary operations on matrices,Rank of a Matrix |
| **2** | Inverse of a Matrix, Linear Dependence and Independence of rows and columns of Matrix |
| **3** | Row rank and column Rank of a matrix. Eigenvalues, Eigenvectors and the characteristic equation of a matrix |
| **4** | Minimal Polynomial of a Matrix, Cayley Hamilton Theorem and its use in finding inverse of a matrix |
| **5** | Application of matrices to a system of linear (both homogeneous and non-homogeneous) equations |
| **6** | Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices |
| **7** | Bilinear and Quadratic forms |
| **8** | Revision of Unit-I and Unit-II and Test |
| **9** | Relation between the roots and coefficients of general polynomial equation in one variable. |
| **10** | Solution of polynomial equations having conditions on roots. |
| **11** | Common roots and multiple roots. Transformation of equations |
| **12** | Nature of roots of an equation. Descartes' rule of signs. |
| **13** | Solution of cubic equation (Cardan' Method) Biquadratic equations and their solutions |
| **14** | Revision of Unit-III and Unit-IV and Test |
| **15** | Revision of All syllabus. |

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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 1st  |
| Subject | Calculus | Session | 2023-2024 |

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| Week | Topics |
| **1** | Epsilon-delta definition of the limit of a function, basic properties of limits, Continuous functions and classification of discontinuities |
| **2** | Differentiability, Successive differentiation, Leibnitz Theorem |
| **3** | Maclaurin and Taylor series expansions |
| **4** | Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Curvature, radius of curvature for cartesian curves, parametric curves, polar curves, Newton’s method. Radius of curvature for pedal curves.  |
| **7** | Tangential polar equations. Centre of curvature, circle of curvature, Chord of curvature, evolutes.  |
| **8** | Revision of previous topics and Test. |
| **9** | Test for concavity and convexity, points of inflexion, Multiple points. |
| **10** | Cusps, nodes and conjugate points, Types of cusps,Tracing of curves in Cartesian, parametric and polar coordinates. |
| **11** | Reduction formulae, rectification, intrinsic equation of curve |
| **12** | Quadrature, Sectorial area, Area bounded by closed curves |
| **13** | Volumes and surfaces of solids of revolution |
| **14** | Theorems of Pappu’s and Guilden. |
| **15** | Doubt and Revision of previous Topics. |

**Lesson Plan**

Name of the Assistant Professor: **Ms. Manisha Session: 2023-24**

Class and Section: **B.Sc. 1st Semester**

Subject: **Mathematics (Solid Geometry)**

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| **Week** | **Topics** |
| 1 | Introduction to Conic Section, general equation of second degree always represents a conic section, centre of a conic section, find coordinates of centre of conic section & equation of conic section referred to centre as origin, exercise 1. |
| 2 | Find the length and equation of the axes, eccentricity, foci, equation of directrix of central conic, exercise 1.2, Find axis, Latus Rectum, Tangent at vertex of parabola, exercise 1.3.Tracing of Conic, exercise 2.1. |
| 3 | Find equation of tangent and normal to conic, equation of pair of tangents, equation of diameters, condition that a line touches given conic, equation of polar, pole, equation of director circle, exercise 1.4. Test |
| 4 | Introduction to System of conics, intersection of two conics, Find the equation of conic which passes through the intersection of a conic and two given straight lines, exercise 3.1. |
| 5 | Introduction to confocal conics, find equation of conic which are confocal with ellipse, confocal conic through given point, confocal parabolas, theorems on confocal conics, Exercise 4.1 |
| 6 | Introduction to Sphere, diameter form of equation of sphere, touching of two spheres, exercise 1, four point form of sphere, exercise 2, plane section of sphere, great circle, exercise 3, sphere through a given circle, intersection of two sphere, exercise 4, Sphere and a line, exercise 5. |
| 7 | Tangent plane to sphere, condition to tangency, exercise 6, plane of contact, diametral plane, polar plane, pole, exercise 7, angle of intersection of two spheres, orthogonal spheres, condition of orthogonality, exercise 8, radical plane of two spheres, co-axal system of spheres, limiting point, exercise 9, Class Test.  |
| 8 | Introduction to cone, exercise1, exercise 2, right circular cone, exercise 3,4, enveloping cone , exercise 5, intersection of a cone and line, exercise 6, cone have 3 mutually perpendicular generators, exercise 7, 8, Introduction to cylinder. |
| 9 | Introduction to Conicoid, tracing of Conicoid, condition of tangency, exercise 1, director sphere, equation of normal, number of normals to an ellipsoid, exercise 2, polar plane , condition for two planes to be conjugate, exercise 3.  |
| 10 | Enveloping cone, enveloping cylinder, exercise 4, plane section with centre, exercise 5, tracing of paraboloid, intersection of line and paraboloid, exercise 6, number of normals to paraboloid, exercise 7. |
| 11 | Introduction to plane section of Conicoid, area of central plane section, exercise 1, axes of non central plane section, exercise 2, circular section of ellipsoid, exercise 3, plane section section of paraboloids, exercise 4. |
| 12 | Introduction to generating lines, properties of generating lines of hyperboloid of one sheet, problems on generating lines, exercise 1, properties of generating lines of hyperbolic paraboloid, exercise 2. |
| 13 | Introduction to confocal conicoids, confocal touching a given plane, confocal touching a given line, confocals cut at right angle, exercise 1, parameters of confocals through a given point on a conicoid, equation of enveloping cone, exercise 2. |
| 14 | Reduction of second degree equations, diameteral planes, principal planes, transformation of second degree equations, exercise 1, case 2 when one root of discriminating cubic is zero, exercise 2. |
| 15 |  Case 3 when one root of discriminating cubic is zero, exercise 3, case 4, exercise 4, case 5, exercise 5. |
| 16 | Examination |

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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 3rd  |
| Subject | Advance Calculus | Session | 2023-2024 |

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| Week | Topics |
| **1** | Continuity, Sequential continuity, properties of continuous functions, Uniform continuity, Chain rule of differentiability |
| **2** | Mean value theorems; Rolle’s theorem and Lagrange’s mean value theorem and their geometrical interpretations |
| **3** | Taylor’s theorem with various form of remainders, Darboux intermediate value theorem for derivatives, Intermediate forms |
| **4** | Limit and continuity of real valued functions of two variables, Partial differentiation, Total differentials; Composite functions and implicit functions |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Change of variables, Homogeneous functions and Euler’s Theorem on Homogeneous functions |
| **7** | Taylor’s theorem for functions of two variables |
| **8** | Revision of previous topics and Test. |
| **9** | Differentiability of real valued functions of two variable. Schwarz and Young’s theorem.  |
| **10** | Implicit function theorem, Maxima, Minima and saddle points of two variables |
| **11** | Lagrange’s method of multipliers, Curves: Tangents, Principal normal, Binormals, Serret-Frenet formulae |
| **12** | Locus of centre of curvature, Spherical curvature, Locus of centre of spherical curvature |
| **13** | Involutes, Evolutes, Bertrand curves |
| **14** | Surfaces: Tangent planes, one parameter family of surfaces, Envelopes. |
| **15** | Doubt and Revision of previous Topics. |

**Lesson Plan**

Name of the Assistant Professor: **Ms. Manisha**

Class and Section: **B.Sc. 3rd Semester**

Subject: **Mathematics (Statics)**

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| Week | Topics |
|  | Introduction to forces, parallelogram law, problems of exc 1.1, components and resolved parts of forces, exercise 1.2, triangle law of forces and its converse, lambda-mu theorem, exercise 1.3, Lami’s theorem and its converse, exercise 1.4. |
|  | Polygon law of forces, exercise 1.5, exercises 1.6, equilibrium of body forces, exercise 1.7, Introduction of parallel forces, Problems of exercise 2.1. |
|  | Introduction of moments, exercise 3.1, Varignon’s theorem, exercise 3.2, centre of number of parallel forces, moment of forces about line, exercise 3.3, CLASS TEST |
|  | Introduction to Couples, equilibrium of two couples, exercise 4.1, resultant of force and couples, exercise 4.2, equilibrium of three forces acting at a point, trigonometrical theorem, problems based on them, exercise 5.1, condition of equilibrium of any number of forces, exercise 5.2.  |
|  | Introduction to friction, forces of friction, static, dynamical friction and their laws, forces on a body at different conditions, exercise 6.1, problems on equilibrium of rods and ladders, exercise 6.2,Class Test. |
|  | Centre of mass,Centre of gravity of uniform rod, triangular lamina, parallelogram, trapezium, quadrilateral, exercise 7.1. |
|  | Centre of gravity of a body by integration of rod, triangular lamina, segment of circle, solid cone, arc of plane curve, exercise 7.2. |
|  | Introduction to virtual work, principle of virtual work and important results, problems based on them, exercise 8.1. |
|  | Parallelepiped of forces, results based on couples, composition of couples, condition of equilibrium of a rigid body, poinsot’s central axis. |
|  | Problems based on forces in three dimension, exercise 9.1,CLASS TEST |
|  | Introduction to wrenches, resultant of two wrenches, problems based on them, exercise 10.1 |
|  | Equilibrium of bodies, stable, unstable & neurtal equilibrium, condition of stability, problems based on them. |
|  | Exercise 12.1, Introduction to null lines and null planes, problems based on them, exercise 11.1 |
|  | CLASS TEST, Problem discussion based on chapters covered previously.  |
|  | Doubt session |
|  | EXAMINATIONS |

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| **Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Semester | 3rd |
| Subject | Partial Differential Equations | Session | 2023-2024 |

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| Week | Topics |
| **1** | Partial Differential Equation: Formation order and Degree, Complete solution, Singular solution, General solution  |
| **2** | Solution’s of Lagrange’s linear equations, Charpit’s general method of solution,  |
| **3** | Compatible systems of first order equations, Jacobi Method |
| **4** | Linear partial differential equation of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant co-efficients |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Partial differential equation with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, |
| **7** | Equations reducible to linear equations with constant co-efficients. |
| **8** | Revision of previous topics and Test. |
| **9** | Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions |
| **10** | Solution of linear hyperbolic equations, Monge’s method for partial differential equations of second order. |
| **11** | Cauchy’s problem for second order partial differential equations |
| **12** | Characteristic equations and characteristic curves of second order partial differential equation, |
| **13** | Method of separation of variables: Solution of Laplace’s equation, Wave equation (one and two dimensions), |
| **14** | Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system. |
| **15** | Doubt and Revision of previous Topics. |

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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 5th  |
| Subject | Real Analysis | Session | 2023-2024 |

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| Week | Topics |
| **1** | Riemann integral, Integrability of continuous and monotonic functions. |
| **2** | The fundamental theorem of integral calculus, Mean value theorems of integral calculus |
| **3** | Improper integral and their convergence, comparison tests |
| **4** | Abel’s and Dirichlet’s tests, Frullani’s integral, Integral as a function of a parameter |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Continuity, Differentiability and integrability of an integral of a function of a parameter  |
| **7** | Definition and examples of metric spaces, neighbourhoods, limit points, interior points |
| **8** | Revision of previous topics and Test. |
| **9** | Open and Closed sets, closure and interior, boundary points, subspace of a metric space |
| **10** | Equivalent metrics, Cauchy sequences, completeness, Cantor’s intersection theorem, Baire’s category theorem, Contraction principle. |
| **11** | Continuous functions, Uniform continuity, compactness for metric spaces |
| **12** | Sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property |
| **13** | Continuity in relation with compactness, connectedness, components |
| **14** | Continuity in relation with connectedness. |
| **15** | Doubt and Revision of previous Topics. |

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**GCW Gurawara, Rewari**

**Lesson Plan**

Name of the Assistant Professor: **Ms. Manisha Session: 2023-24**

Class and Section: **B.Sc. 5th Semester**

Subject: **Mathematics (Numerical Analysis)**

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| **Week** | **Topics** |
| 1 | Introduction to finite difference operators, forward difference, backward difference, fundamental theorem of difference calculus, properties of operators, difference of some functions. |
| 2 | Displacement or shift operators and its properties, relation between various operators, exercise 1.1, error in tabular value, exercise 1.2. |
| 3 | Introduction to interpolation, Newton’s formula for forward interpolation, Newton backward interpolation formula, exercise 2.1, subdivision of intervals, exercise 2.2 |
| 4 | Newton’s divided difference formula, exercise 3.1, lagrange’s interpolation formula, Hermite’s interpolation formula, exercise 3.2. |
| 5 | Gauss forward interpolation formula, Gauss backward interpolation formula, Sterling formula, Bessel’s formula, exercise 4.1. |
| 6 | Introduction to probability distribution, random variable, mean and variance of a random variable, binomial distribution, Recurrence formula, fitting a binomial distribution, exercise 5.1, 5.2. |
| 7 | Poisson distribution, normal distribution, exercise 5.3, 5.4, Introduction to numerical differentiation. |
| 8 | Numerical distribution using Newton forward, Newton backward, Sterling formula, exercise 6.1. |
| 9 | Eigen values, eigen vectors, Power method, Jacobi’s method for symmetric matrix, Tridiagonal matrix. |
| 10 | Given’s method, House holder method, exercise 7.1, QR method, Lancoz’s method. |
| 11 | Numerical integration, Newton-Cotes quadrature formula, Trapezoidal rule, Simpson’s one-third rule, Simpson’s three-eighth rule, error in quadrature formulae.  |
| 12 | Gauss’s quadrature formula, exercise 8.1. Introduction to numerical solution of ODE, Single step and multiple step method, Euler’s method, Euler’s modified method, exercise 9.1, Taylor’s series method, RK Method. |
| 13 | Picard’s Method, exercise 9.2, predictor corrector method: Milne- Simpson’s Method, Adam-Bashforth method, exercise 9.3. |
| 14 | Program of Newton forward, Newton backward interpolation formula, Lagrange’s interpolation.  |
| 15 | Program of Trapezoidal rule, Simpson’s one-third rule, Simpson’s three-eighth rule, Euler’s Method, Euler’s Modified method. |

**Lesson Plan**

Name of the Assistant Professor: **Ms. Manisha Session: 2023-24**

Class and Section: **B.Sc. 5th Semester**

Subject: **Mathematics (Groups & Rings)**

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| Week | Topics |
| 1 | Introduction to Binary operations, properties of binary operations, composition table, Group, Abelian group, problems based on them, exercise 1.1, general properties & theorems of group. |
| 2 | Order of an element of a group, theorems, exercise 1.2, Sub group of a group, theorems, exercise 1.3, cyclic groups, theorems, Euler’s function, exercise 1.4. |
| 3 | Left, right cosets, theorems, index of a subgroup in a group, congruence modulo of a subgroup, index, exercise 2.1, normal subgroup, theorems, exercise 2.2, Quotient group, exercise 2.3. |
| 4 | Homomorphism of groups, Isomorphism of groups, theorems, kernel of homo, fundamental theorem of isomorphism, exercise 3.1, automorphism of a group, group of automorphism of groups, theorems, centre of a group, exercise 3.2. |
| 5 | Normalizer of an element, commutator, exercise 3.3, permutations, composition of two functions, transposition, even odd permutations, alternating group, cayley theorem, exercise 4.1. |
| 6 | Intro to Rings, problems based in rings, exercise 5.1, subrings, theorems, characteristic of a ring, theorems, exercise 5.2. |
| 7 | Ideals and its properties, principal ideal, principal ideal ring, principal ideal domain, theorems,. |
| 8 | Prime ideal, problems on ideals, exercise 6.1. |
| 9 | Ring homomorphism, theorems, fundamental theorem of homomorphism, second theorem of isomorphism, embedding of rings, theorems, exercise 7.1. |
| 10 | Euclidean ring, unit element, Gaussian integer, greatest common divisor, least common multiple, PID, theorems based on the, class test |
| 11 | Exercise 8.1, polynomial ring, embedding of R into R[x], polynomials over a field, division algorithm for F[x]. |
| 12 | Remainder theorem, theorems, unique factorization domain and its theorems, gauss lemma. |
| 13 | Field of quotients of UFD, Eisenstein’s irreducibility criterion. |
| 14 | Exercise 9.1, Class Test. |
| 15 | Problem Discussion |