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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 2nd  |
| Subject | Number Theory and Trigonometry | Session | 2023-2024 |

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| Week | Topics |
| **1** | Principal of Mathematical Induction, Divisibility, Division Algorithm, GCD and LCM, Theorems on Prime Numbers |
| **2** | Fundamental Theorem of Arithmetic, Congruences, Linear Congruences, Diophantine Equations |
| **3** | Fermat’s Theorem, Wilson’s Theorem and Chinese Remainder Theorem |
| **4** | Euler function, Residues, Complete and Reduces Residue system |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Euler’s Generalization of Fermat’s Theorem, Greatest Integer function, Divisor of n and sigma function of n |
| **7** | Theorems on sigma(n) and d(n), Mobius function, Mobius Inversion Formula. |
| **8** | Revision of previous topics and Test. |
| **9** | De Moivre’s Theorem, Roots of complex numbers, Solving equation using De Moivre’s Theorem |
| **10** | Expansion of sin *nx,* cos *nx,* tan *nx,* Formation of equations |
| **11** | Expansion of $cos^{n}x, sin^{n}x$ , Exponential function |
| **12** | Sin z, Cos z, Euler’s Theorem, Logarithm function, General Exponential function |
| **13** | Inverse circular function of a real variable and complex variable |
| **14** | Gregory’s Series, Series of sine and cosine |
| **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. 2nd Semester**

Subject: **Mathematics (Vector Calculus)**

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| **Week** | **Topics** |
| 1 | Introduction to Scalars and Vector, properties of vectors and scalars, intro to triple product of vectors. |
| 2 | Scalar triple product and its geometrical interpretation, volume of parallelepiped, volume of tetrahedron, Problems of exercise 1.1. |
| 3 | Intro to Vector Triple product, Problems based on vector triple product, exercise 1.2, Intro to product of four vectors, exercise 1.3, Reciprocal system of vectors, and its properties |
| 4 | problems based on reciprocal system of vectors, exercise 1.4, Limit and continuity of vector functions, Derivative of vector functions w.r.t. scalars, Derivative of function of functions, CLASS TEST |
| 5 | Problems on derivatives, exercise 2.1, velocity, acceleration, exercise 2.2, Partial derivatives of vector functions, exercise 3.1, vector differential operator, gradient of a scalar field and its properties, problems on gradient and exercise 3.2. |
| 6 | Level surfaces, directional derivatives of scalar point functions, equation of tangent and normal to level surfaces, Problems based on them & exercise 3.3,Divergence of a vector function, Problems on divergence of a function, exercise 3.4 |
| 7 | Curl of a vector point function and its properties, problems based on curl and exercise 3.5, Laplacian operator, problems on laplacian and exercise 3.6, CLASS TEST. |
| 8 | Introduction to curvilinear coordinates, orthogonal curvilinear co-ordinates, Arc length, volume element and area element; gradient, divergence and curl in terms of curvilinear co-ordinates,  |
| 9 | Cylindrical and spherical co-ordinate system, examples based on these topics, exercise 4.1 |
| 10 | Introduction to vector Integration, standard results on integration, Problems on integration, exercise 5.1, introduction to line integrals, circulation, work done, examples and problems of exercise 5.2  |
| 11 | Surface integrals, problems on surface integrals, exercise 5.3 |
| 12 | Volume integral, problems based on volume integrals, exercise 5.4 |
| 13 | Gauss’s Divergence Theorem, Problems on Gauss’s theorem, exercise 6.1 |
| 14 | Stoke’s theorem, problems based on stokes theorem, Introduction to Green’s theorem, problems based on Green’s theorem, exercise 6.2 |
| 15 | Problem Discussion, CLASS TEST |

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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 2nd  |
| Subject | ODE | Session | 2023-2024 |

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| Week | Topics |
| **1** | Definition of differential equation, order and degree of a differential equation, formation of differential equation. Geometrical Meaning of differential equation. |
| **2** | Exact Differential equations, integrating factors, Finding Integrating factor by inspection, Rule 1, 2, 3, 4, 5 for finding integrating factor. |
| **3** | First order higher degree equations solvable for x, y, p Lagrange’s equations,  |
| **4** | Clairaut’s equations. Equation reducible to Clairaut’s form. Singular solutions. |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self-orthogonal family of curves. |
| **7** | Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations. |
| **8** | Revision of previous topics and Test. |
| **9** | Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. |
| **10** | Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation.  |
| **11** | Method of variations of parameters. Method of undetermined coefficients. |
| **12** | Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. |
| **13** | Simultaneous equation of the form dx/P = dy/Q = dz/R. Total differential equations. Condition for Pdx + Qdy +Rdz = 0 to be exact. |
| **14** | General method of solving Pdx + Qdy + Rdz = 0 by taking one variable constant. Method of auxiliary equations. |
| **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** | 4th  |
| **Subject** | Introduction to C and Numerical Methods | **Session** | 2023-2024 |

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| **Week** | **Topics** |
| **1** | Programmer Model of Computer, Algorithm, Flow Charts, Introduction to C, Character set, C-Tokens, Key Words, Constants. |
| **2** | Identifiers, Variables, Data Types, Qualifiers, Assignment, Typedef, Enum, Scanf and Printf, Main functions, Directive, Comments. |
| **3** | A Typical C program, Arithmetic Operators, Relational Operators, Logical Operators, Assignment, Increment, Decrement and Conditional Operators. |
| **4** | Bitwise and Special Operators, Program based on If statement, If else and Nested If, Revision and Doubt Class |
| **5** | Program based on switch, goto, break statement. |
| **6** | Program based on while, do while and for loop |
| **7** | Functions: Definition, Call, Declaration, Global and Local Variables. |
| **8** | Revision of previous topics and Test. |
| **9** | Macros, Arrays, Passing Array to function. |
| **10** | Reading Strings, Strcat() function, Copying Strings, Structures, Structures of Arrays, Union, Pointers. |
| **11** | Pointers and Arrays, Pointers and Structures, Bisection Method, Regular False and Secant Method. |
| **12** | Newton Rahpson, Gauss Elimination, Gauss Jordan, LU Decomposition. |
| **13** | Crout’s Method, Choleksy Method, Jordan,  |
| **14** | Gauss Seidal and Relaxation Method |
| **15** | Doubt and Revision of previous Topics. |

**GCW Gurawara, Rewari**

**Lesson Plan**

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

Class and Section: **B.Sc. 4th Semester**

Subject: **Mathematics (Sequences & Series)**

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| Week | Topics |
| 1 | Introduction to Sequences & Series |
| 2 | Bounded, Convergent, Divergent Sequences, Theorems based on limit of sequences, Exercise 2.1 |
| 3 | Monotonic sequences, Cauchy sequence, Cauchy general principle of convergence, theorems & problems based on them, exercise 2.2  |
| 4 | Introduction to subsequences, Theorems/Problems of subsequences, Introduction to Infinite series, CLASS TEST |
| 5 | Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Problems of Comparison test, Cauchy’s general principle of Convergence of series. |
| 6 | Test of convergence and divergence of geometric series, Problems of geometric series test, Hyper Harmonic series or p-series, Convergence or Divergence of Infinite series. CLASS TEST |
| 7 | D-Alembert’s ratio test (with proof), Problems of ratio test, Raabe’s test (with proof), Problems of Raabe's test, Logarithmic test & problems based on it. |
| 8 | de Morgan and Bertrand’s test, Cauchy’s Nth root test (with proof), Gauss Test (with proof), Cauchy’s integral test (with proof), Cauchy’s condensation test & problems based on them. CLASS TEST |
| 9 | Alternating series, Leibnitz’s test, absolute and conditional convergence, Problems of Leibnitz's test, and Arbitrary series: Abel’s lemma. |
| 10 | Abel’s test, Dirichlet’s test, problems based on them. CLASS TEST |
| 11 | Introduction of Real Numbers, Boundedness of the set of real numbers; l.u.b & g.l.b of a set, Neighborhoods of a set, interior points of a set, Isolated points of a set, limit points of a set, problems based on them.  |
| 12 | Open Set, Closed set, Theorems and problems on Open & Closed Sets, Interior of a set in real numbers and theorems based on it. |
| 13 | Closure of a set in real numbers & their properties, Theorems on closure of set, Bolzano-Weierstrass theorem |
| 14 | Open covers, sub covers and their theorems, Compact sets, Theorems of Compact set, Heine-Borel Theorem. CLASS TEST |
| 15 | Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet’s theorem, Riemann’s Re-arrangement theorem, problems based on them. |

**Lesson Plan**

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

Class and Section: **B.Sc. 4th Semester**

Subject: **Mathematics (Special Functions and Integral Transforms)**

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| Week | Topics |
| 1 | Introduction to Power series, convergence of power series, interval of convergence, exercise 1.1, shifting of summation index, exercise 1.2, analytical functions, ordinary and singular points of DE, exercise 1.3, existence of power series solution, exercise 1.4. |
| 2 | Frobenius method, exercise 1.5, problems of exercise 1.6, 1.7 |
| 3 | Beta function, gamma function and their properties, Bessel’s equation and it’s solution, Bessel’s functions and various results based on them, exercise 2.1, Generating function for Jn(x), exercise 2.2, equations reducible to Bessel’s equations, exercise 2.3. |
| 4 | Orthogonality relation of Bessel’s function, Introduction to Legendre’s equation and its solution, Rodrigue’s formula, derivation of Legendre’s polynomials from Rodrigue’s formula, exercise 3.1, recurrence relations, exercise 3.2, orthogonality of legendre polynomial, exercise 3.3. |
| 5 | Hermite’s equation and its solution, Hermite’s polynomial, Rodrigue’s formula for Hn(x), Recurrence relations, orthogonal property, exercise 4.1. |
| 6 | Intro to Laplace transformation, LT of some elementary functions, exercise 5.1, first shifting property, change of scale property, exercise 5.2, Piece-wise continuity of a function in an interval, unit step function, second shifting property, exercise 5.3.  |
| 7 | Laplace transformation of derivatives, periodic functions, integrals, exercise 5.4, 5.5, laplace transformation of some functions, exercise 5.6, Inverse Laplace transformation. |
| 8 | Problems on Inverse Laplace transformation, exercise 6.1, problems of exercise 6.2 |
| 9 | Convolution theorem, exercise 6.3, solution of linear ODE of constant coefficient with laplace transformation, exercise 8.1, solution of linear ODE of variable coefficient with laplace transformation, |
| 10 | Exercise 8.2, solution of simultaneous linear equation with transformation, exercise 8.3, intro to Fourier transformation, change of scale, shifting and modulus properties,  |
| 11 | Exercise 9.1, Fourier Sine and Cosine transformation, exercise 9.2, Inverse transforms, exercise 9.3. |
| 12 | Convolution theorem of fourier transform, relation between fourier and laplace transformation, Parseval’s identity, exercise 9.4 |
| 13 | Problems of exercise 9.5, solution of DE by fourier transform. |
| 14 | Problems of solution of DE by fourier transform, exercise 10.1. |
| 15 | Problem Discussion, CLASS TEST |
| 16 |  EXAMINATIONS |

**Lesson Plan**

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

Class and Section: **B.Sc. 6th Semester**

Subject: **Mathematics (Linear Algebra)**

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| **Week** | **Topics** |
| 1 | Introduction to Vector Spaces, examples of Vector Spaces, Exc. 1.1 |
| 2 | Subspaces, theorems on vector subspaces, exercise 1.2, Linear sum of subspaces, disjoint subspaces, exercise 1.3. |
| 3 | Linear combination of vectors, LI, LD vectors, exercise 2.1, spanning set, linear span, exercise 2.2. |
| 4 | Basis, ordered basis, maximal linearly independent set, minimal generating set, dimension of VS, exercise 2.3, CLASS TEST |
| 5 | Identical Spaces, theorem on dimension of Linear sum, complementary subspaces, exercise 2.4, Quotient space, exercise 3.1. |
| 6 | Intro to Linear Transformation, exercise 4.1, one-one LT, Onto LT, Vector Space isomorphism, examples, exercise 4.2, Find LT, Exercise 4.3 CLASS TEST |
| 7 | Null Space, Range Space, Fundamental theorem of VS homomorphism, Sylvester’s law, exercise 5.1 |
| 8 | Sum of LT, Product of two LTs, exercise 6.1, Singular & non-singular LT, Exc. 6.2, Invertible LT, Exc. 6.3. |
| 9 | Ordered basis, Matrix of LT, examples, exercise 7.1, exercise 7.2, Change of basis, exercise 7.3. |
| 10 | Intro to Dual Space, Bi dual of VS, Annihilator, Exercise 8.1, CLASS TEST |
| 11 | Eigen Values, eigen Vectors, Characteristic polynomial, Diagonalization, exercise 9.1, minimal polynomial, exercise 9.2.  |
| 12 | Inner product Spaces, examples, Normed Linear Space, Orthogonal Vectors. |
| 13 | Orthonormal Set, Bessel’s Inequality, Gram-Schmidt Orthogonalization.  |
| 14 | Exercise 10.1, CLASS TEST |
| 15 | Adjoint Operator, self adjoint operator, problems based on them, exercise 11.1 |

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| **GCW Gurawara, Rewari****Lesson Plan** |
| Name | Krishan Sharma | Designation | Assistant Professor |
| Class | B.Sc.  | Sem | 6th  |
| Subject | Real and Complex Analysis | Session | 2023-2024 |

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| Week | Topics |
| **1** | Jacobians, Functional Dependence, Beta and Gamma Functions |
| **2** | Double Integral, Triple Integral, Substitution method for double and triple integral, Application of Double and Triple Integral |
| **3** | Change of order of Integration, Dirichlet’s Integral |
| **4** | Fourier Series, Fourier Coefficients, Fourier series for odd and even functions, Dirichlet’s conditions, properties of Fourier coefficients |
| **5** | Revision of previous topics and doubt sessions. |
| **6** | Fourier series of piecewise continuous functions, Change of interval, half range series. |
| **7** | Parseval’s Identity for Fourier Series, Stereographic projection of Complex numbers, Limits, continuity, uniform continuity and differentiability of complex functions |
| **8** | Revision of previous topics and Test. |
| **9** | Analytic functions, CR-equation, Necessary and sufficient conditions for analytic functions |
| **10** | CR equations in polar form, Orthogonal system, Harmonic functions |
| **11** | Constructions of analytic functions, Multivalued functions, Exponential functions, Trignometric functions, General power of z |
| **12** | Elementary mappings, Conformal mappings, Mobius Transformation, Cross Ratio |
| **13** | Exponential, Logarithm, sin z, cos z, tan z transformation |
| **14** | Square root transformation, Results on Mobius Transformation. |
| **15** | Doubt and Revision of previous Topics. |

**Lesson Plan**

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

Class and Section: **B.Sc. 6th Semester**

Subject: **Mathematics (Dynamics)**

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| Week | Topics |
| 1 | Introduction to Simple harmonic Motion, derivation for velocity and position of particle executing SHM, time period, frequency, amplitude. |
| 2 | Problems based on SHM, exercise 1. Introduction to Elastic strings, derivations fro horizontal and vertical elastic strings. |
| 3 | Problems based on elastic strings, Introduction to mass, momentum, force & Newton’s laws of motion, exercise 1, CLASS TEST |
| 4 | Pressure of a body resting on a horizontal plane moving vertically upward or downwards, problems based on them, exercise 2. |
| 5 | Motion of two bodies connected by a string, motion of body on smooth & rough horizontal plane, problems & exercise 3. Class Test |
| 6 | Introduction to projectiles, motion of projectile, latus rectum, vertex, focus, directrix, axis of trajectory of a projectile, time of flight, horizontal range and greatest height of a projectile, directions of projections. |
| 7 | Problems & exercise 1, velocity at any point of a trajectory & exercise2. |
| 8 | Directions of projection for a particle to hit a given point, problems & exercise 3, range & time of flight on an inclined plane. |
| 9 | Maximum range up the plane, directions of projection for a given velocity and a given range, velocity when the particle strikes the plane. |
| 10 | Condition that the particle may strike the plane, range and time of flight down an inclined plane, exercise 4. CLASS TEST |
| 11 |  HOLI VACCATION |
| 12 | Introduction to central orbits, differential equation of central orbit, areal velocity, elliptic, parabolic & hyperbolic orbits. |
| 13 | Problems & exercise 1, Apse & Apsidal distances,  |
| 14 | Theorems based on Apses, problems & exercise 2. |
| 15 | CLASS TEST, Problem discussion based on chapters covered previously.  |
| 16 | Introduction to Kepler’s Laws of planetary motion, deductions from Kepler’s law, motion under the inverse square law. |
| 17 | Geometrical properties of an ellipse, problems & exercise 1. CLASS TEST |
| 18 | Revision & problem discussion on whole syllabus. |
| 19 |  EXAMINATIONS |