

Government Chandulal Chandrakar Arts and Science College, Patan
DEPARTMENT OF MATHEMATICS

Teaching Plan
Academic Year: 2022-23

Name of Department: Mathematics

Name of Teacher: Dr. Rohit Kumar Verma

Course Type: Theory

Class: **B.Sc. Part-I (PCM Group)****Course Title:**

ALGEBRA AND TRIGONOMETRY (Paper-I)


CALCULUS (Paper-II)


VECTOR ANALYSIS AND GEOMETRY (Paper-III)

Month	Title/ Unit	Topic of Lecture	No. of Lectures	Methods /mode of Delivery
August	Algebra and Trigonometry (Unit-I, II)	<ul style="list-style-type: none"> Elementary operations on matrices Inverse of a matrix. Linear independence of row and column matrices Row rank column rank and rank of a matrix. Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equations of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Application of matrices to a system of linear (both homogeneous and nonhomogeneous) equations. Theorems on consistency of a system of linear equations. Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descartes's rule of signs. Solutions of cubic equations (Cardons method). Biquadratic equation. 	20	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes
September	Algebra and Trigonometry (Unit-III, IV)	<ul style="list-style-type: none"> Mappings, Equivalence relations and partitions. Congruence modulo n. Definition of a group with examples and simple properties. Subgroups, generation of groups, cyclic groups, coset decomposition, Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Normal subgroups. Quotient group, Permutation groups. Even and odd permutations. The alternating groups An. Cayley's theorem. Homomorphism and Isomorphism of groups. The fundamental theorems of homomorphism. Introduction, properties and examples of rings, Subrings, Integral domain and fields Characteristic of a ring and Field. 	20	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes


October	Algebra and Trigonometry (Unit-V) Calculus (Unit-I)	<ul style="list-style-type: none"> • TRIGONOMETRY: De-Moiver's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series. • DIFFERENTIAL CALCULUS: $\varepsilon - \delta$ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
November	Calculus (Unit-II, III)	<ul style="list-style-type: none"> • Asymptotes. Curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in cartesian and polar coordinates. • INTEGRAL CALCULUS: Integration of transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
December	Calculus (Unit-IV, V)	<ul style="list-style-type: none"> • ORDINARY DIFFERENTIAL EQUATIONS: Degree and order of a differential equation. Equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. • Linear differential equations of second order. Transformation of the equation by changing the dependent variable/the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations. 	20 +15=35*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
January	Vector Analysis and Geometry (Unit-I, II, III)	<ul style="list-style-type: none"> • Scalar and vector product of three vectors. Product of four vectors. Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl. • Vector integration. Theorems of 	20 +15=35*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT

		Gauss, Green, Stokes and problems based on these. • General equation of second degree. Tracing of conics. System of conics. Confocal conics. Polar equation of a conic.		
February	Vector Analysis and Geometry (Unit-IV, V)	• Sphere. Cone. Cylinder. • Central Conicoid. Paraboloids. Plane sections of conicoid. Generating lines. Confocal Conicoid. Reduction of second degree equations.	20*	1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
February	Paper-1 Paper-2 Paper-3	• Revision • Old Question Paper solving • Mentor-Mentee Class • Group Discussion	10*	1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Special Classes


Signature of teacher
(Dr. R.K. Verma)


Signature of H.O.D.

विभागाध्यक्ष
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कला एवं विज्ञान महाविद्यालय
पाटन, जि.- दुर्ग (छ.प्र.)


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College Patan, Distt.-Durg (C.G.)

Name of Department: Mathematics

Name of Teacher: Dr. Rohit Kumar Verma

Course Type: Theory

Class: B.Sc. Part-II (PCM Group)

Course Title:

Advanced Calculus (Paper-I)
Differential Equation (Paper-II)
Mechanics (Paper-III)

Month	Title/ Unit	Topic of Lecture	No. of Lectures	Methods /Mmode of Delivery
August	Advanced Calculus (Unit-I, II)	<ul style="list-style-type: none"> • Sequence-Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms • Comparison tests, Cauchy's integral test, Ratio tests, Raabe's, Logarithmic, De Morgan and Bertrand's tests. • Alternating series, Leibnitz's theorem. Absolute and conditional convergence. • Continuity, Sequential continuity, Properties of continuous functions, Uniform continuity, Chain rule of differentiability, • Mean value theorems and their geometrical interpretations • Darboux's intermediate value theorem for derivatives, Taylor's theorem with various forms of remainders. • Limit and continuity of functions of two variables. 	15	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
September	Advanced Calculus (Unit-III, IV)	<ul style="list-style-type: none"> • Partial differentiation. Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians. • Envelopes, evolutes. Maxima, minima and saddle points of functions of two variables. • Lagrange's multiplier method. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
October	Advanced Calculus (Unit-V) Differential Equation (Unit-I)	<ul style="list-style-type: none"> • Euler Integral- Beta and Gamma functions, Double and triple integrals, Dirichlet's integrals. • Change of order of integration in double integrals. • Series solutions of differential equations- Power series method, • Bessel and Legendre functions and their properties-convergence, recurrence and generating relations, Orthogonality of functions, • Sturm-Liouville problem, Orthogonality of eigenfunctions, Reality of eigen values, Orthogonality of Bessel functions and Legendre polynomials. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
November	Differential Equation (Unit-II, III)	<ul style="list-style-type: none"> • Laplace Transformation- Linearity of the Laplace transformation, Existence theorem for Laplace transforms, • Laplace transforms of derivatives and integrals, 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test

	III)	<ul style="list-style-type: none"> Laplace transforms of derivatives and integrals, Shifting theorems. Differentiation and integration of transforms. Convolution theorem. Solution of integral equations and systems of differential equations using the Laplace transformation. Partial differential equations of the first order. Lagrange's solution, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method of solution. 		<ol style="list-style-type: none"> Test Notes Use of ICT
December	Differential Equation (Unit-IV, V)	<ul style="list-style-type: none"> Partial differential equations of second and higher orders, Classification of linear partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients, Monge's methods. Calculus of Variations- Variational problems with fixed boundaries- Euler's equation for functionals containing first order derivative and one independent variable, Extremals, Functionals dependent on higher order derivatives, Functionals dependent on more than one independent variable, Variational problems in parametric form, invariance of Euler's equation under coordinates transformation. Variational Problems with Moving Boundaries- Functionals dependent on one and two functions, One sided variation. Sufficient conditions for an Extremum- Jacobi and Legendre conditions, Second Variation. Variational principle of least action. 	20 +15=35*	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes Use of ICT
January	Mechanics (Unit-I, II, III)	<ul style="list-style-type: none"> Analytical conditions of Equilibrium, Stable and unstable equilibrium. Virtual work, Catenary. Forces in three dimensions, Poinsot's central axis, Null lines and planes. Simple harmonic motion. Elastic strings. Velocities and accelerations along radial and transverse directions, Projectile, Central orbits. 	20 +15=35*	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes Use of ICT
February	Mechanics (Unit-IV, V)	<ul style="list-style-type: none"> Kepler's laws of motion, velocities and acceleration in tangential and normal directions, motion on smooth and rough plane curves. Motion in a resisting medium, motion of particles of varying mass, motion of a particle in three dimensions, acceleration in terms of different co-ordinate systems. 	20*	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes Use of ICT
February	Paper-1 Paper-2 Paper-3	<ul style="list-style-type: none"> Revision Old Question Paper solving Mentor-Mentee Class Special Classes Group Discussion 	10*	<ol style="list-style-type: none"> Chalk & Talk Method Problem Solving Group Discussion Test Notes

Government Chandulal Chandrakar Arts and Science College, Patan
DEPARTMENT OF MATHEMATICS
Teaching Plan
Academic Year: 2022-23

Name of Department: Mathematics

Name of Teacher: Dr. Rohit Kumar Verma

Course Type: Theory

Class: **B.Sc. Part-II (PCM Group)****Course Title:**

Advanced Calculus (Paper-I)
 Differential Equation (Paper-II)
 Mechanics (Paper-III)

Month	Title/ Unit	Topic of Lecture	No. of Lectures	Methods /Mode of Delivery
August	Advanced Calculus (Unit-I, II)	<ul style="list-style-type: none"> • Sequence-Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms • Comparison tests, Cauchy's integral test, Ratio tests, Raabe's, Logarithmic, De Morgan and Bertrand's tests. • Alternating series, Leibnitz's theorem. Absolute and conditional convergence. • Continuity, Sequential continuity, Properties of continuous functions, Uniform continuity, Chain rule of differentiability, • Mean value theorems and their geometrical interpretations • Darboux's intermediate value theorem for derivatives, Taylor's theorem with various forms of remainders. • Limit and continuity of functions of two variables. 	15	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
Septemb	Advanced	• Partial differentiation , Change of variables,	20	1. Chalk & Talk Method

Government Chandulal Chandrakar Arts and Science College, Patan
DEPARTMENT OF MATHEMATICS
Teaching Plan
Academic Year: 2022-23

Name of Department: Mathematics

Name of Teacher: Dr. Rohit Kumar Verma

Course Type: Theory

Class: **B.Sc. Part-III (PCM Group)**

Course Title:

ANALYSIS (Paper-I)

ABSTRACT ALGEBRA (Paper-II)

(II) DISCRETE MATHEMATICS (Paper-III)

Month	Title/ Unit	Topic of Lecture	No. of Lectures	Methods /mode of Delivery
August	Analysis (Unit-I, II)	<ul style="list-style-type: none"> • METRIC SPACES: Definition and examples of metric spaces. Neighbourhoods, Limit points, Interior points, Open and Closed sets, Closure, and interior. Boundary points, Sub-space of a metric space. Cauchy sequences, Completeness, Cantor's intersection theorem. Contraction principle, construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field. • Dense subsets. Baire Category theorem. Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity, isometry and homeomorphism. Equivalent metrics. Compactness, sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and Compact sets, Connectedness, Components, Continuous functions and Connected sets. 	15	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
September	Analysis (Unit-III, IV)	<ul style="list-style-type: none"> • COMPLEX ANALYSIS: Complex numbers as ordered pairs. Geometrical representation of complex numbers. Stereographic projection. Continuity and differentiability of complex functions. Analytic functions. Cauchy Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed points, Cross ratio. Inverse points and critical mappings. Conformal mappings. • REAL ANALYSIS: Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's test. Multiplication of series. Double series. Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT

2022-23

TEACHING PLAN

October	Analysis (Unit-V) Abstract Algebra (Unit-I)	<ul style="list-style-type: none"> • Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests. Abel's and Dirichlet' tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. • Group- Automorphisms, inner automorphism. Automorphism of groups and their computations, Conjugacy relation, Normaliser, Counting principle and the class equation of a finite group. Centre for Group of prime-order, Abelianizing of a group and its universal property. Sylow's theorems, Sylow subgroup, Structure theorem for finite Abelian groups. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
November	Abstract Algebra (Unit-II, III)	<ul style="list-style-type: none"> • Ring theory- Ring homomorphism. Ideals and quotient rings. Field of quotients of an integral domain, Euclidean rings, polynomial rings, Polynomials over the rational field. The Eisenstien criterion, polynomial rings over commutative rings, Unique factorization domain. R unique factorisation domain implies so is $R[x_1, x_2, \dots, x_n]$. Modules, Submodules, Quotient modules, Homomorphism, and Isomorphism theorems. • Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span, Linear dependence, independence, and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension. 	20	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
December	Abstract Algebra (Unit-IV, V)	<ul style="list-style-type: none"> • Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms. • Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's 	20 +15= 35*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT

		inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.		
January	Discrete Mathematics (Unit-I, II, III)	<ul style="list-style-type: none"> • Sets and Propositions - Cardinality. Mathematical Induction, Principle of inclusion and exclusion. • Computability and Formal Languages - Ordered Sets. Languages. Phrase Structure Grammars. Types of Grammars and Languages. Permutations. Combinations and Discrete Probability. • Relations and Functions - Binary Relations, Equivalence Relations, and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle. • Graphs and Planar Graphs - Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Planner Graphs. Trees. • Finite State Machines - Equivalent Machines. Finite State Machines as Language Recognizers. • Analysis of Algorithms - Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions. 	20 +15=35*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
February	Discrete Mathematics (Unit-IV, V)	<ul style="list-style-type: none"> • Recurrence Relations and Recursive Algorithms - Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Solution. Total Solution. Solution by the Method of Generating Functions. Brief review of Groups and Rings. • Boolean Algebras - Lattices and Algebraic Structures. Duality, Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Propositional Calculus. Design and Implementation of Digital Networks. Switching Circuits. 	20*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes 6. Use of ICT
February	Paper-1 Paper-2 Paper-3	<ul style="list-style-type: none"> • Revision • Old Question Paper solving • Mentor-Mentee Class • Group Discussion 	10*	<ol style="list-style-type: none"> 1. Chalk & Talk Method 2. Problem Solving 3. Group Discussion 4. Test 5. Notes

Signature of teacher

(Dr. R. K. Verma)

Signature of H.O.D.

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Signature of Principal

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**Government Chandulal Chandrakar Art and Science College,
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DEPARTMENT OF MATHEMATICS

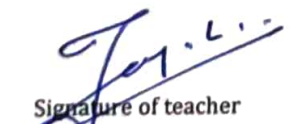
Teaching Plan


Academic Year: 2022-2023


Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper-I

Class: **M.Sc. IV Sem.**
Course Title: **Integration Theory & Functional Analysis**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit - 1	Uniform boundedness theorem and some its consequences. Open mapping and closed graph theorems.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit - 2 Unit-3	Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces. Reflexive spaces. Weak Sequential Compactness. Compact Operators. Solvability of linear equations in Banach spaces. The closed Range Theorem. Inner product spaces. Hilbert spaces. Orthonormal Sets. Bessel 's inequality. Complete orthonormal sets and Parseval's identity.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
March	Unit - 4	Structure of Hilbert spaces. Projection theorem. Riesz representation theorem. Adjoint of an operator on a Hilbert space. Reflexivity of Hilbert spaces.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit - 5 Exam. Prep.	Self-adjoint operators, Positive, projection, normal and unitary operators. Abstract variational boundary-value problem. The generalized Lax-Milgram theorem. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes


Signature of teacher
Jayendra


Signature of H.O.D
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**Government Chandulal Chandraker Art and Science College,
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DEPARTMENT OF MATHEMATICS

Teaching Plan

Academic Year: 2022-2023

Name of department – **Mathematics**
Name of teacher – **Priya Chandraker**
Paper No- **II**

CLASS: **M.Sc. IV Sem.**
Course Title: **Mechanics**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Generalized coordinates. Holonomic and Non-holonomic systems. Scleronomic and Rheonomic systems. Generalized potential. Lagrange 's equations of first kind. Lagrange 's equations of second kind. Uniqueness of solution. Energy equation for conservative fields. Hamilton 's variables. Donkin 's theorem. Hamilton canonical equations. Cyclic coordinates. Routh 's equations.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit – 2	Poisson 's Bracket. Poisson 's Identity. Jacobi -Poisson Theorem. Motivating problems of calculus of variations, shortest distance. Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic. Fundamental lemma of calculus of variations. Euler 's equation for one dependent function and its generalization to (i) 'n 'dependent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit – 3 Unit – 4	Hamilton 's Principle. Principle of least action. Poincare Cartan Integral invariant. Whittaker 's equations. Jacobi 's equations. Lee Hwa Chung 's theorem, canonical transformations and properties of generating functions. Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit – 5 Exam. Prep.	Attraction and potential of rod, disc, spherical shells and sphere. Surface integral of normal attraction (Application & Gauss ' theorem). Laplace and Poisson equations. Work done by self-attracting systems. Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics. Surface density in terms of surface harmonics. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes

Signature of teacher

प्रिआ चंद्राकर

Signature of H.O.D

प्रिआ चंद्राकर

गणित विभाग

शास. चन्द्रलाल चन्द्राकर

कला एवं विज्ञान महाविद्यालय

पाटन, जि.- दुर्ग (उ.प्र.)

Signature of principal

Principal

Govt G.V.G.I.A.S. Art and Science College

Patan, Dist.-Durg (C.G.)

**Government Chandulal Chandrakar Art and Science College,
Patan, dist.-Durg (C.G.)**

DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher –**Priya Chandrakar**
Paper No.- III

Class: **M.Sc. IV Sem.**
Course Title: **Fuzzy Set Theory & Its Applications-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy Propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions, the compositional rule of inference.	10	<ol style="list-style-type: none"> 1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit – 2	Approximate Reasoning-An overview of Fuzzy expert system. Fuzzy Implications and their selection. Metacondition approximate reasoning. The role of fuzzy relation equation.	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
	Unit-3	.An introduction to Fuzzy Control-Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification		
March	Unit-4	Defuzzification and the various defuzzification methods (the centre of area, the centre of maxima, and the mean of maxima methods).	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit –5	Decision Making in Fuzzy Environment- Individual decision making. Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods. Fuzzy linear Programming.	15	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
	Exam. Prep.	Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.		

Signature of teacher

Signature of H.O.D

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शास. चन्दुलाल चन्द्राकर
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पतन विद्यापीठ (उ.ग.)
(म.प्र.) डि. - दुरग

Signature of principal
Principal

Govt.C.L.C.Arts and Science
College Patan, Dist.-Durg (C.G.)

**Government Chandulal Chandrakar Art and Science College,
Patan, dist.-Durg (C.G.)**

DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher –**Priya Chandrakar**
Paper No.- III


Class: **M.Sc. IV Sem.**
Course Title: **Fuzzy Set Theory & Its Applications-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit - 1	Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy Propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions, the compositional rule of inference.	10	<ol style="list-style-type: none"> 1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit - 2 Unit-3	Approximate Reasoning-An overview of Fuzzy expert system. Fuzzy Implications and their selection. Metacondition approximate reasoning. The role of fuzzy relation equation. .An introduction to Fuzzy Control-Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit-4	Defuzzification and the various defuzzification methods (the centre of area, the centre of maxima, and the mean of maxima methods).	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit -5 Exam. Prep.	Decision Making in Fuzzy Environment- Individual decision making. Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods. Fuzzy linear Programming. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes


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(प.स) डि. २०२२-२३

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper-IV

Class: **M.Sc. IV Sem.**
Course Title: **Operations Research-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit - 1	Dynamic Programming - Deterministic and Probabilistic Dynamic programming. Integer Programming- Branch and Bound Technique.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit -2 Unit-3	Game Theory-Two-Person, Zero-Sum Games. Games with Mixed Strategies. Graphical, Solution. Solution by Linear Programming. Integer Programming-Branch and Bound Technique.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit -4	Queuing system: Deterministic Queuing system, probability distribution in Queuing, classification of Queuing models, Poission Queuing system ((M/M/I):(#/FIFO), (M/M/I):(SIRO), (M/M/I):(N/FIFO). Inventory control: The concept of EOQ, Deterministic inventory problem with no shortages.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit -5 Exam. Prep.	Nonlinear Programming-One and Multi-Variable Unconstrained Optimization. Kuhn-Tucker Conditions for Constrained Optimization. Quadratic Programming. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes


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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department - **Mathematics**
Name of teacher - **Dr. R. K. Verma**
Paper No.-V

Class: **M.Sc. IV Sem.**
Course Title: **Graph Theory-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit - 1	Ramsey Theory: Perceptness-preserving operations, Forbidden Subgraph orientations, Ramsey numbers and Ramsey graphs.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit - 2	Groups: Permutation groups, The automorphism group, graphs with given group, symmetry concepts, pseudo-similarity and stability, spectral studies of the Automorphism group.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
	Unit-3	Polynomials and Graph Enumeration: The colour polynomials, The chromatic polynomial, The bivariate colouring polynomials.		
March	Unit -4	Graph Enumeration: Co-chromatic (co-dichromatic) graphs and chromatically unique graphs, Graph Enumeration.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit -5	Digraphs & Networks: Digraphs, Types of connectedness, Flows in Networks, Menger's and Konig's Theorem, Degree sequences.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
	Exam. Prep.	Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc		

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper No.- 1

Class: **M.Sc. II Sem.**
Course Title: **Advanced Abstract Algebra -II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Modules - Cyclic modules. Simple modules. Semi-simple modules. Schuler's Lemma. Free modules. Noetherian and Artinian modules and rings-Hilbert basis theorem. Wedderburn Artin theorem. Uniform Modules, primary modules, and Noether-Lasker theorem.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
February	Unit – 2	Linear Transformations - Algebra of linear transformation, Singular and non singular transformation, characteristic roots and vectors, matrices and linear transformations.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit – 3 Unit- 4	Canonical Forms - Similarity of linear transformations. Invariant subspaces. Reduction to triangular forms. Nilpotent transformations. Index of nilpotency. Invariants of a nilpotent transformation. The primary decomposition theorem. Jordan blocks and Jordan forms. Smith normal form over a principal ideal domain and rank. Fundamental structure theorem for finitely generated modules over a Principal ideal domain and its applications to finitely generated abelian groups.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit – 5 Exam. Prep.	Rational canonical form. Generalised Jordan form over any field. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Priya Chandrakar**
Paper No.-II

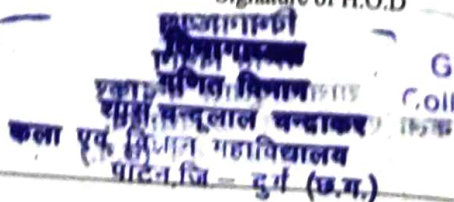
Class: **M.Se. II Sem.**
Course Title: **Real Analysis -II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Definition and existence of Riemann-Stieltjes integral, Properties of the Integral, integration and differentiation, the fundamental theorem of Calculus, integration of vector-valued functions, Rectifiable curves.	10	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
February	Unit – 2	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets. Integration of Non-negative functions. The General integral. Integration of Series.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit – 3,4	Measures and outer measures, Extension of a measure. Uniqueness of Extension. Completion of a measure. Measure spaces. Integration with respect to a measure. Riemann and Lebesgue Integrals. The Four derivatives. Lebesgue Differentiation Theorem. Differentiation and Integration.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit – 5 Exam. Prep.	Functions of Bounded variation. The L_p -spaces. Convex functions. Jensen 's inequality. Holder and Minkowski inequalities. Completeness P of L_p , Convergence in Measure, Almost uniform convergence. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes

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DEPARTMENT OF MATHEMATICS

Teaching Plan


Academic Year: 2022-2023

Name of department – **Mathematics**
Name of teacher – **Priya Chandraker**
Paper No.-III


Class: **M.Sc. II Sem.**
Course Title: **Algebraic Topology-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps.	10	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
February	Unit – 2	Product spaces, separation axioms, Connectedness (Tychonoff's theorem). Compactness, product spaces Countability in product space.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit – 3,4	Embedding and metrization. Embedding lemma and Tychonoff embedding. The Urysohn metrization theorem. Metrization theorems and Paracompactness-Local finiteness. The Nagata-Smirnov metrization theorem. Paracompactness. The Smirnov metrization theorem. Nets and filter. Topology and convergence of nets. Hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. Ultra-filters and Compactness.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit – 5 Exam. Prep.	The fundamental group and covering spaces- Homotopy of paths. The fundamental group. Covering spaces. The fundamental group of the circle and the fundamental theorem of algebra. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc.	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes

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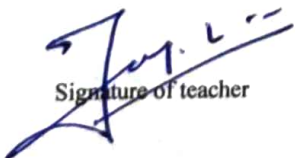
DEPARTMENT OF MATHEMATICS


**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper No.-IV

Class: **M.Sc. II Sem.**
Course Title: **Advanced Complex Analysis-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Weierstrass factorisation theorem. Gamma function and its properties. Riemann Zeta function. Riemann's functional equation. Runge's theorem. Mittag-Leffler's theorem.	10	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
February	Unit – 2	Analytic Continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation Schwarz Reflection Principle. Monodromy theorem and its consequences..	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit – 3 Unit- 4	Harmonic functions on a disk. Harnack's inequality and theorem. Dirichlet Problem. Green's function. Canonical products. Jensen's formula. Poisson – Jensen formula. Hadamard's three circles theorem. Order of an entire function. Exponent of Convergence. Borel's theorem. Hadamard's factorization theorem.	25	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit – 5 Exam. Prep.	The range of an analytic function. Bloch's theorem. The Little Picard theorem. Schottky's theorem. Montel Caratheodory and The Great Picard theorem. Univalent functions. Bieberbach's conjecture (Statement only) and the "1/4 -theorem." Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc	15	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes


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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Dr. R.K.Verma**
Paper No.-V

Class: **M.Sc. II Sem.**
Course Title: **Advanced Discrete Mathematics-II**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
January	Unit – 1	Graph Theory-Definition of (Undirected) Graphs, Paths, Circuits, Cycles, & Subgraphs. Induced Subgraphs. Degree of a vertex. Connectivity. Planar Graphs and their properties. Trees. Euler's Formula for connected planar Graphs. Complete & Complete Bipartite Graphs. Kuratowski's Theorem (statement only) and its use.	10	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
February	Unit – 2	Spanning Trees, Cut-sets, Fundamental Cut -sets, and Cycle. Minimal Spanning Trees and Kruskal's Algorithm. Matrix Representations of Graphs. Euler's Theorem on the Existence of Eulerian Paths and Circuits.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
March	Unit –3 Unit-4	Directed Graphs. In degree and Out degree of a Vertex. Weighted undirected Graphs. Dijkstra's Algorithm..strong Connectivity & Warshall's Algorithm. Directed Trees. Search Trees. Tree Traversals. Introductory Computability Theory-Finite State Machines and their Transition Table Diagrams. Equivalence of finite State Machines. Reduced Machines. Homomorphism.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
April	Unit –5 Exam. Prep.	Finite Automata. Acceptors. Non-deterministic Finite Automata and equivalence of its power to that of Deterministic Finite Automata. Moore and mealy Machines. Turing Machine and Partial Recursive Functions. Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc	15	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes

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DEPARTMENT OF MATHEMATICS**

**Teaching Plan
Academic Year: 2022-2023**

Name of department - **Mathematics**
Name of teacher - **Jayendra Shrivastava**
Course type: **Theory**

CLASS: **M.Sc. I Sem.**
Course Title: **Advanced Abstract Algebra - I**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Groups - Normal and Subnormal series. Composition series. Jordan-Holder theorem. Solvable groups. Nilpotent groups.	15	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Field theory- Extension fields. Algebraic and transcendental extensions. Separable and inseparable extensions. Algebraically closed fields.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3 Unit-4	Perfect fields. Finite fields. Primitive elements. Normal extensions, Splitting field. Automorphism of extensions. Galois extensions. Fundamental theorem of Galois theory.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
November	Unit -5	Solution of polynomial equations by radicals. Insolvability of the general equation of degree 5 by radicals.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam. Prep.	Problem solving Old Question Paper solving Extra Class for Slow and Advance Learner Project Preparation Internal Exam P.L. University Exam	20	

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DEPARTMENT OF MATHEMATICS**

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Course Title: **Real Analysis-I**

Class: **M.Sc. I Sem.**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Sequences and series of functions, point-wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel 's and Dirichlet 's tests for uniform convergence, uniform convergence and continuity, definition and simple properties of Riemann -Stieltjes integral, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation, Weierstrass approximation theorem	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Rearrangements of terms of a series, Riemann's theorem.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3 Unit-4	Functions of several variables, linear transformations, Derivatives in an open subset of R^n , Chain rule, Partial derivatives, interchange of the order of differentiation, Derivatives of higher orders, Taylor 's theorem, Inverse function theorem, Implicit function theorem. Jacobians, extremum problems with constraints, Lagrange's multiplier method, Differentiation of integrals.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
November	Unit - 5	Partitions of unity, Differential forms, Stoke's theorem.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam. Prep.	Problem solving Old Question Paper solving Extra Class for Slow and Advance Learner Project Preparation Internal Exam P.L. University Exam	20	

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Course Title: **Topology-I**

Class: **M.Sc. I- Sem.**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Countable and uncountable sets. Infinite sets and the Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Cantor's theorem and the continuum hypothesis. Zorn's lemma, well-ordering theorem. Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighbourhoods. Interior, exterior and boundary. Accumulation points and derived sets. Bases and sub-bases. Subspaces and relative topology.	15	<ol style="list-style-type: none"> 1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Nbd. Systems. Continuous functions And homeomorphism. First and Second Countable spaces. Lindelof's theorems. Separable spaces. Second countability and separability.	20	<ol style="list-style-type: none"> 1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3 Unit-4	Separation axioms; their Characterizations and basic properties. Urysohn's lemma, Tietze extension theorem. Compactness. Continuous functions and compact sets. Basic properties of Compactness. Compactness and finite intersection property. Sequentially and countably compact sets. Local compactness and one point compactification. Stone-Cech compactification	20	<ol style="list-style-type: none"> 1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
November	Unit - 5	Compactness in metric spaces. Equivalence of compactness, countable Compactness and sequential compactness in metric space. Connected spaces. Connectedness on the real line. Components. Locally connected spaces.	20	<ol style="list-style-type: none"> 1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam. Prep.	Problem solving Old Question Paper solving Extra Class for Slow and Advance Learner Project Preparation Internal Exam P.L. University Exam	20	

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Course type: **Theory**

CLASS: **M.Sc. I- Sem.**
Course Title: **Complex Analysis-I**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Complex integration, Cauchy- Goursat Theorem. Cauchy's integral formula. Higher order derivatives. Morera's Theorem. Cauchy 's Inequality and Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem. Laurent's series. Isolated singularities. Meromorphic functions.	15	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Maximum modulus principle. Schwarz lemma. The argument principle. Rouché's theorem Inverse function theorem.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to $\arg z$, $\log z$.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
	Unit-4	Definitions and examples of conformal mapping Bilinear transformations, their properties and classifications.		
November	Unit -5	Spaces of analytic functions. Hurwitz 's theorem. Montel 's theorem Riemann mapping theorem.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam. Prep.	Problem solving Old Question Paper solving Extra Class for Slow and Advance Learner Project Preparation Internal Exam P.L. University Exam	20	7.

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कला विद्यालय
(स.ग.)

**Government Chandulal Chandrakar Art and Science College,
Patan, Dist.-Durg (C.G.)**

DEPARTMENT OF MATHEMATICS

Teaching Plan

Academic Year: 2022-2023

Name of department – **Mathematics**
Name of teacher – **Dr. R. K. Verma**
Course type: **Theory**

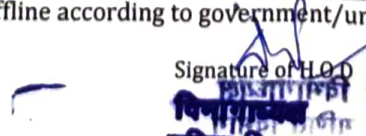
Class: **M.Sc. I Sem.**
Course Title: **Advance Discrete Mathematics-I**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Formal Logic-Statements. Symbolic Representation and Tautologies. Quantifiers, Predicates and Validity. Propositional Logic. Semigroups & Monoids-Definitions and Examples of Semigroups and Monoids (including those pertaining to concatenation operation).	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Homomorphism of semigroups and monoids. Congruence relation and Quotient Semigroups. Subsemigroup and submonoids. Direct Products. Basic Homomorphism Theorem.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
	Unit-3	Lattices-Lattices as partially ordered sets. Their properties. Lattices as Algebraic Systems. Sublattices, Direct products, and Homomorphisms. Some Special Lattices e.g., Complete, Complemented and Distributive Lattices. Boolean Algebras-Boolean Algebras as Lattices. Various Boolean Identities. The Switching Algebra example. Sub-algebras		
October	Unit - 4	Direct Products and Homomorphisms. Join-Irreducible elements, Atoms and Minterms. Boolean Forms and Their Equivalence. Minterm Boolean Forms, Sum of Products Canonical Forms. Minimization of Boolean Functions. Applications of Boolean algebra to Switching Theory (using AND, OR & NOT gates). The Karnaugh Map Method.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
November	Unit - 5	Grammars and Languages-Phrase-Structure Grammars. Rewriting Rules. Derivations. Sentential Forms. Language generated by a Grammar. Regular, Context-Free, and Context Sensitive Grammars and Languages. Regular sets, Regular Expressions and the Pumping Lemma. Kleene's Theorem. Notions of Syntax Analysis, Polish Notations. Conversion of Infix Expressions to Polish Notations. The Reverse Polish Notation.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam Prep.	Problem solving Old Question Paper solving Extra Class for Slow and Advance Learner Project Preparation Internal Exam P.L. University Exam	20	

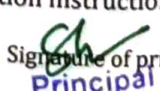
Remark:- Teaching will be offline according to government/university/local administration instruction.

Signature of teacher

Signature of H.O.D


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पाटन, जि.- दुर्ग (छ.ग.)

Signature of principal


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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper No.-I

Class: **M.Sc. III Sem.**
Course Title: **Integration Theory and Functional Analysis**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Signed measure. Hahn decomposition theorem, mutually singular measures. Radon-Nikodym theorem. Lebesgue decomposition. Riesz-representation theorem. Extension theorem (Caratheodory).	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Lebesgue-Stieltjes integral, product measures, Fubini's theorem. Differentiation and Integration. Decomposition into absolutely continuous and singular parts.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3	Normed linear spaces. Banach spaces and examples. Quotient space of normed linear spaces and its completeness, equivalent norms. Riesz Lemma, basic properties of finite dimensional normed linear spaces and compactness.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
November	Unit - 4 Unit- 5	Weak convergence and bounded linear transformations, normed linear spaces of bounded linear transformations, dual spaces with examples. Contraction mapping theorem and its application, Banach fixed point theorem, Picard's theorem, Banach fixed point theorem as a source of existence and uniqueness theorem for integral equations, Nonlinear operator, example's convex function, epigraph, monotone mapping, monotone, coercive mapping duality maps.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December	Exam. Prep.	Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc. P.L. University Exam	15	

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DEPARTMENT OF MATHEMATICS

Teaching Plan

Academic Year: 2022-2023

Name of department - **Mathematics**
Name of teacher - **Jaynendra Shrivastava**
Paper No.-II

Class: **M.Sc. III Sem.**
Course Title: **Partial Differential Equations**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Sequences and series of functions, pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel 's and Dirichlet 's tests for uniform convergence, uniform convergence and continuity, definition and simple properties of Riemann -Stieltjes integral, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation, Weierstrass approximation theorem.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Heat Equation-Fundamental Solution, Mean Value Formula, Properties of Solutions, Energy Methods. Wave Equation-Solution by Spherical Means, Non-homogeneous Equations, Energy Methods.	20	1.Chalk and talk method 2.Collection of projects 3.Group discussion 4.Test 5.Notes
October	Unit - 3	Non-linear First Order PDE-Complete Integrals, Envelopes, Characteristics, Hamilton Jacobi Equations (Calculus of Variations, Hamilton 's ODE, Legendre Transform, Hopf-Lax Formula, Weak Solutions, Uniqueness), Conservation Laws (Shocks, Entropy Condition, Lax Oleinik formula, Weak Solutions, Uniqueness, Riemann 's Problem, Long Time Behaviour)	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
November	Unit - 4 Unit- 5	Representation of Solutions-Separation of Variables, Similarity Solutions (Plane and Travelling Waves, Solutions, Similarity under Scaling), Fourier and Laplace Transform, Hopf-Cole Transform, Hodograph and Legendre Transforms, Potential Functions. Asymptotic (Singular Perturbations, Laplace 's Method, Geometric Optics, Stationary Phase, Homogenization), Power Series (Non-characteristic Surfaces, Real Analytic Functions, Cauchy-Kovalevskaya Theorem).	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December		Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc. P.L. University Exam	15	

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कला एवं विज्ञान महाविद्यालय
पटन, जि. - दुर्ग (म.प्र.)
प्रकाशक: श्री. जयनंद शrivastava
इकाई: गणित विभाग
(प.स) पटन, म.प्र.

**Government Chandulal Chandrakar Art and Science College, Patan,
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DEPARTMENT OF MATHEMATICS

Teaching Plan

Academic Year: 2022-2023

Name of department – **Mathematics**
Name of teacher – **Jayendra Shrivastava**
Paper No.-III

Class: **M.Sc. III Sem.**
Course Title: **Fuzzy Set Theory & Its Applications-I**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Fuzzy sets-Basic definitions, \mathbb{N} -level sets. Convex fuzzy sets. Basic operations on fuzzy sets. Types of fuzzy sets. Cartesian products, Algebraic products. Bounded sum and difference, t-norms and t-conorms.	10	1. Chalk and talk method 2. Group discussion 3. Test 4. Notes
September	Unit - 2	The Extension Principle- The Zadeh's extension principle. Image and inverse image of fuzzy sets. Fuzzy numbers. Elements of fuzzy arithmetic.	20	1. Chalk and talk method 2. Group discussion 3. Test 4. Notes
October	Unit - 3	Fuzzy Relations on Fuzzy sets, Composition of Fuzzy relations. Min- Max composition and its properties.	20	1. Chalk and talk method 2. Group discussion 3. Test 4. Notes
November	Unit - 4	Fuzzy equivalence relations. Fuzzy compatibility relations. Fuzzy relation equations. Fuzzy graphs, Similarity relation.	25	1. Use of ICT 2. Chalk and talk method 3. Group discussion 4. Test 5. Notes
	Unit- 5	Possibility Theory-Fuzzy measures. Evidence theory. Necessity measure. Possibility measure. Possibility distribution. Possibility theory and fuzzy sets. Possibility theory versus probability theory.		
December		Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc. P.L. University Exam	15	

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चन्द्रलाल चन्द्रकार (स.ग.) कलेज
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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department - **Mathematics**
Name of teacher - **Jaynendra Shrivastava**
Paper No.-IIV

Class: **M.Sc. I Sem.**
Course Title: **Operations Research-I**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Operations Research and its Scope. Necessity of Operations Research in Industry. Linear Programming-Simplex Method. Theory of the Simplex Method. Duality and Sensitivity Analysis.	10	1. Chalk and talk method 2. Collection of project 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Other Algorithms for Linear Programming-Dual Simplex Method.	20	1. Chalk and talk method 2. Collection of project 3. Group discussion 4. Test 5. Notes
October	Unit - 3	Parametric Linear Programming. Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming.	20	1. Chalk and talk method 2. Collection of project 3. Group discussion 4. Test 5. Notes
November	Unit - 4 Unit- 5	Transportation and Assignment Problems. Network Analysis-Shortest Path Problem. Minimum Spanning Tree Problem. Maximum Flow I Problem. Minimum Cost Flow Problem. Network Simplex Method. Project Planning and Control I with PERT-CPM.	25	1. Chalk and talk method 2. Collection of project 3. Group discussion 4. Test 5. Notes
December		Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc. P.L. University Exam	15	

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DEPARTMENT OF MATHEMATICS

**Teaching Plan
Academic Year: 2022-2023**

Name of department - **Mathematics**
Name of teacher - **Dr. R. K. Verma**
Paper No.-V

Class: **M.Sc. I Sem.**
Course Title: **Graph theory-I**
Course type: **Theory**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
August	Unit - 1	Operations on graphs, matrices and vector spaces: Topological operations, Homeomorphisms, homomorphism, contractions, derived graphs, Binary operations.	10	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
September	Unit - 2	Matrices and vector spaces: Matrices and vector spaces: The adjacency matrix, The determinant and the spectrum, Spectrum properties, The incidence matrix, cycle space and Bond space, Cycle bases and cycle graphs.	20	1. Chalk and talk method 2. Collection of projects 3. Group discussion 4. Test 5. Notes
October	Unit - 3	Colouring packing and covering: Vertex coverings, critical graphs, Girth and chromatic number, uniquely colourable graphs, edge-colourings, Face colourings and Beyond, The achromatic and the Adjoint Numbers.	20	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
November	Unit- 4 Unit- 5	Combinational formulations: Setting up of combinational formulations, the classic pair of duals, Gallai, Norman-Rabin Theorems, Clique parameters, The Rosenfeld Numbers Perfect Graphs: Introduction to the "SPGC", Triangulated (Chordal) graphs, Comparability graphs, Interval graphs, permutation graphs, circular arc graphs, split graphs, weakly triangulated graphs.	25	1. Use of ICT 2. Chalk and talk method 3. Collection of projects 4. Group discussion 5. Test 6. Notes
December		Problem Solving Old Question Paper Solving Extra Class for slow and advance learner Internal Exam Project Preparation Examination Preparation, etc. P.L. University Exam	15	

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