Teaching plan

Mahavir College Kolhapur

Department of Mathematics

Annual Teaching Plan

Academic year 2024-2025 B.Sc. Part-I Semester I Department - Mathematics

Subject - Mathematics Course -

Paper -I- : Differential Calculus

Name of teacher – Ms. Patil R.S

Month-July			Module/Unit	Sub-units planned
Lectures 8	Practicals	Total 8	Unit-1: Limit And Continuity:	1.1 Definition of limit of a real-valued function 1.2 Algebra of limits 1.3 Limit at infinity and infinite limits 1.4 Definition: Continuity at a point and Continuous functions on inte 1.5 Theorem: If f and g are continuous functions at point x = a, then f f.g and f/g are continuous at point.
Month-August				
Lectures 08	Practicals 8	Total 16	Unit -1 Limit And Continuity	1.6 Theorem: Composite function of two continuous functions is conti 1.7 Examples on continuity. 1.8 Classification of Discontinuities (First and second kind), Removab Discontinuity, Jump Discontinuity.
			Unit-1 Limit And Continuity	Properties of continuity of Real Valued functions: 1.9 Theorem: If a function is continuous in the closed interval [a, b] bounded in [a, b] 1.10 Theorem: If a function is continuous in the closed interval [a itattains its bounds at least once in [a, b]. 1.11 Theorem: If a function f is continuous in the closed interval [a, f(a)and f(b) are of opposite signs then there exists c□(a, b) such that f(c) = 0,
Month-September				
Lectures 8	Practicals 4	Total 12	Unit-1 Limit And Continuity	Theorem: If a function f is continuous in the closed interval [a, b] and f(b) then f assumes every value between f (a) and f (b). 1.13 Uniform continuity.
			Unit-2 Differentiability:	2.1 Differentiability of a real-valued function 2.2 Geometrical interpretation of differentiability 2.3 Relation between differentiability and continuity 2.4 Chain rule of differentiation 2.5 Mean Value theorems: Rolle's theorem, Lagrange's mea value theorem, Cauchy's mean value theorem 2.6 Geometrical interpretation of mean value theoren 2.7 Partial differentiation Successive differentiation

Month- October – November				
Lectures 6	Practicals 8	Total 14	Unit-2 Differentiability	2.1 Successive differentiation 2.2 Leibnitz's theorem and its application 2.3 Maclaurin's and Taylor's theorems Maclaurin's and Taylor's expansion for standard function

Name & Signature of Teacher Ms. Patil R.S

Annual Teaching Plan

Academic year 2024-2025 B.Sc. Part-I Semester I Department - Mathematics

Subject - Mathematics Course -

Paper II – Basic Algebra and complex number

Name of teacher – Patil H.K

Month-July			Module/Unit	Sub-units planned
Lectures 08	Practicals 16	Total 24	Unit-1 Theory of Equations	1.1 Nature of solution of AX = 0 1.2 Non – Homogeneous linear equations 1.3 Working rule for finding solution of AX = B Examples.
Month-August				
Lectures 09	Practicals 16	Total 25	Unit -1 Theory of Equation	1.1 Relations between the roots and the coefficients of polynomial equations Integral and rational roots.
			Unit-1 Complex Number	1.1 Introduction 1.2 Polar representation of complex numbers 1.3 De Moivre's theorem (integer and rational indices) 1.4 Roots of a complex number, expansion of $\cos n\theta, \sin n\theta$ 1.5 Euler's exponential form of a complex number 1.6 circular function and its periodicity Hyperbolic function
Month-September				
Lectures 08	Practicals 20	Total 28	Unit-2 Matrices:	2.1 Types of Matrix, Transpose of matrix, Conjugate of matrix, Transposed- conjugate of a matrix 2.2 Row reduction and echelon forms 2.3 The rank of a matrix and applications, Inverse of matrix 2.4 Eigenvalues and eigenvectors of matrix
			Unit-2 Matrices	2.5 Cayley-Hamilton theorem and its

				application System of linear equations 2.6 Homogeneous linear equations
Month- October November				
Lectures 12	Practicals 16	Total 28	Unit-2 Matrices	2.7 Nature of solution of AX = 0 2.8 Non – Homogeneous linear equations 2.9 Working rule for finding solution of AX = B Examples.

Name & Signature of Teacher Ms. Patil R.S

Annual Teaching Plan

Academic year 2024 -2025 B.Sc. Part-I Semester II Department – Mathematics

Subject - Mathematics Course -

Paper III : Differential Equations - I

Name of teacher – Ms.Rutuja Patil

Month- November-December			Module/Unit	Sub-units planned
Lectures 09	Practicals 8	Total 17	Unit-1: Differential Equations of first order and first degree:	1.3 Revision: Definition of Differential equation, order and degree of Differential equation. 1.4 Definition: Exact Differential equations. 1.5 Theorem: Necessary and sufficient condition for exactness. 1.2.2Working Rule for solving an exact differential equation 1.6 1.2.3 Integrating Factor (I.F.) by using rules (without proof). 1.7 Linear Differential Equation: Definition. 1.8 Method of solution. 1.9 Bernoulli’s Differential Equation: Definition. 1.10 Method of solutionMethod of solution.

				1.11 Bernoulli's Differential Equation: Definition. 1.12 Method of solution. 1. Method of solution
Month-January				
Lectures 9	Practicals 8	Total 17	Unit -1 Differential Equations of first order and first degree	Orthogonal trajectories: Cartesian and polar co-ordinates. Linear Differential Equations with constant Coefficients:
			Unit-1 Differential equation of first order and first degree	1.5.1 Method of solution. 1.6 Orthogonaltrajectories: Cartesian and polar co-ordinates. Linear Differential Equations with constant Coefficients: 1.7 Definition: Complementary function (C.F.) and particular integral (P.I.), operator D. 1.8 General Solution of f(D) y=0. 1.8.1 Solution of f (D) y = 0 when A.E. has non-repeated roots. 1.8.2 Solution of f (D) y = 0 when A.E. has repeated roots. 1.8.3 Solution of f (D) y = 0 when A.E. has non-repeated roots real and complex roots. 1.10 Solution of D(y) = X, where X is of the form 1.10.1 $e^{ax}, where\ a\ is\ constant$
Month-February				
Lectures 08	Practicals 4	Total 12	Unit-1 Differential equation of first order and first degree	1.10.1 $\sin(ax)$ and $\cos(ax)$ 1.10.2 x^m, m is positive integer 1.10.3 $e^{ax}V, where\ V\ is\ a\ function\ of\ x$ $xV, where\ V\ is\ a\ function\ of\ x.$
Month- March				
Lectures 07	Practicals 4	Total 11	Unit 2 Equation of first order but not first degree	2.1 Equations that can be factorized 2.2 Equation solvable for p 2.3 Equations that cannot be factorized 2.4 Equation solvable for x 2.1 Equations that can be factorized 2.2 Equation solvable for p 2.3 Equations that cannot be factorized 2.4 Equation solvable for x 2.5 Clairat's form and Method of solution Equation reducible to Clairaut's form 2.6 Special form reducible to Clairaut's form

Name & Signature of Teacher Ms. Patil R.S

Annual Teaching Plan

Academic year 2024 -2025 B.Sc. Part-I Semester II Department - Mathematics

Subject - Mathematics Course -

Paper- IV - Discrete Probability Distributions

Name of teacher – Ms Patil H.K

Month- November -December			Module/Unit	Sub-units planned
Lectures 10	Practicals 20	Total 30	Unit-1 Changes of Axis	Translation Rotation Translation and Rotation Rotation followed by Translation Translation followed by Rotation Invariants, Basic theorems Polar Coordinates Polar equation of circle: Centre – radius form Centre at the pole Passing through the pole and touching the polar axis at the pole Passing through the pole and with centre on the initial line
Month-January				
Lectures 09	Practicals 12	Total 21	Unit -1 Changes of Axis	1.1 Passing through the pole and the diameter through pole making an angle α with initial line 1.2 Equation of chord, tangent and normal to the circle $r = 2a\cos\theta$ 1.3 Polar equation of a conic in the form $\frac{l}{r} = 1 \pm e\cos\theta$ 1.4 Polar equation of a conic in the form $\frac{l}{r} = 1 \pm e\cos(\theta - \alpha)$ chord, tangent and normal of conic
			Unit-2 Sphere	2.1 Equation in different form • centre – radius form • General form • Diameter form • Intercept form 2.2 Intersection of sphere with straight line and a plane 2.3 Power of a point and radical plane 2.4 Tangent plane and condition of tangency

				2.5 Equation of circle 2.6 Intersection of (i) two sphere (ii) a sphere and plane Orthogonality of two spheres
Month-February				
Lectures 07	Practicals 16	Total 23	Unit-2 Sphere	Cone 2.1 Definitions of cone, vertex, generators Equation of a cone with vertex at a point (X_1, Y_1, Z_1)
Month- March				
Lectures 12	Practicals 12	Total 20	Unit-2 Sphere	2.10 Equation of a cone with vertex at origin 2.11 Right circular cone and equation of a right circular cone 2.12 Enveloping cone and equation of an enveloping cone 2.13 Equation of a tangent plane Condition of tangency

Name & Signature of Teacher Ms. Patil R.S

Annual Teaching Plan

Academic year 2024 -2025 B.Sc. Part-II Semester III Department -Mathematics

Subject - Mathematics Course -

Paper V- Real Analysis -I

Name of teacher – Patil

Month-July			Module/Unit	Sub-units planned
Lectures 13	Practicals 32	Total 45	Unit-Sets and Functions	Introduction Revision of sets Operation on sets Union, Intersection, Complement, Relative complement, Cartesian product of sets, Relation. Illustrative Examples Functions Definition: Function, Domain, Co-domain, Range, Graph of function, Direct image and Inverse image of a subset under a function. Example of direct image and inverse image of a subset. Definitions Injective, Surjective and Bijective functions (1-1 correspondence) Inverse function. Composite function, Restriction and Extension of a function.
Month-August				
Lectures 13	Practicals 76	Total 89	**Unit -1** Sets and Functions	Mathematical Induction Well ordering Property of Natural Numbers Principles of Mathematical Induction First Version of Principal of Mathematical Induction Second Version of Principal of Mathematical Induction. Principles of Strong Induction Illustrative Examples Multiple Choice Questions
			Unit-2 Countable Sets	Countable Sets Introduction Definitions Equivalent sets, Countable Sets, Uncountable sets. Examples of countable sets Sets of Natural number, Set of Integers, Set of even Natural numbers and odd natural numbers. Proposition: Union of two disjoint countable sets is countable. Theorems and Examples. Illustrative Examples

Month-September				
Lectures 11	Practicals 56	Total 67	Unit-2 Countable Set	2.1 Algebraic and Order Properties of R 2.2 Algebraic properties Properties of real numbers. 2.3 Theorems 2.4 Inequalities 2.5 Arithmetic – Geometric Mena Inequality (With Proof)
			Unit-2 Countable Set	Bernoulli's Inequality (With Proof) Illustrative Examples Absolute Value and the Real Line Definition, Theorems, Triangle Inequality Illustrative Example Completeness Property of R
Month- October-November				
Lectures 12	Practicals 64	Total 76	Unit-2 Countable set	Applications of the Supremum Property Interval Types of Intervals Characterization theorem Multiple Choice Questions

Name & Signature of Teacher Ms. Patil R.S

Annual Teaching Plan

Academic year 2024-2025 B.Sc. Part-II Semester III Department -Mathematics

Subject - Mathematics Course -

Paper VI - Algebra I

Name of teacher – Patil

Month-July			Module/Unit	Sub-units planned
Lectures 12	Practicals 16	Total 28	Unit-1 Matrices and relations)	Definitions: Hermitian and skew Hermitian matrices. Properties of Hermitian and skew Hermitian matrices. Rank of a matrix, Row-echelon Form and reduced row echelon form. System of linear homogeneous equation and linear non-homogeneous equation. Condition for consistency, Nature of the General Solution Gaussian elimination and Gauss Jordon method (Using row-echelon form and reduced row echelon form) Examples The characteristic equation of a matrix, Eigen values, Eigen vectors of the matrix
Month-August				
Lectures 13	Practicals 20	Total 33	Unit-1 Matrices and relation	Cayley Hamilton Theorem 1.6 Applications of Cayley Hamilton theorem (Examples) 1.7 Relations: Definition, Types of relations, Equivalence relation, Partial ordering relation 1.8 Example of equivalence relation and Partial ordering relations. 1.9 Digraphs of relations, matrix representation. Composition of Relations 1.11 Transitive closure, Warhill's algorithm
Month-September				
Lectures 13	Practicals 12	Total 25	Unit-2 Matrices and relation	Equivalence classes, Partition of a set Theorem: Let ~ be an equivalence relation on a set X. Then For every x∈X, x∈$\bar{X}$ For every x, y∈$\bar{X}$,x∈$\bar{Y}$ if and only if $\bar{X} = \bar{Y}$ For every x, y∈$\bar{X}$,either $\bar{X}\cap\bar{Y} = \emptyset$. Equivalence Class Theorem
Month- October -November				

Lectures 12	Practicals 20	Total 32	Unit-2 Groups	**1** Definition **2.2** Group and its properties **2.3** Definition of Group, Semigroup, finite **2.4** Theorem: In a group G The identity element is unique The inverse of each element in G $(a^{-1})^{-1}$=a for all a ∈ G $(ab)^{-1}=b^{-1}a^{-1}$ For all a, b ∈G **Subgroups** **2.5** Definition **2.6** Theorem: A subset H of a group G is a subgroup of G if and only if H is closed under the binary operation of G The identity e of G is in H, For all a ∈H it is true that a^{-1} ∈ H also **2.7** Theorem: A non-empty subset H of a group G is a subgroup of G if and only if for all a, b∈ H. $a*b^{-1}$∈ H. **2.8** Theorem: The intersection of any two subgroups of a group is again a subgroup. **2.9** Definition **2.10** Theorem **2.11** Theorem **Cyclic Groups and its Properties** **2.12** Definition of cyclic group generated by an element, Cyclic subgroup of a group and example **2.13** Theorem **2.14** Order of elements of a group and their properties **2.15** Theorem: Every cyclic group is abelian. **2.16** Theorem: If a is a generator of a cyclic group G, then O(a)=O(G) **Cosets** **2.17** Definition **2.18** Theorem: If H is a subset of G, then Ha=H if and only if a ∈H Ha=Hb if and only if ab^{-1}∈H Ha is a subgroup of G if and only if a ∈H **2.19** Theorem: If H is a subgroup of G, then a one-to-one correspondence exists between any two right(left) cosets of H in G.

Annual Teaching Plan

Academic year 2024 -2025 B.Sc. Part-II Semester IV Department - Mathematics

Subject - Mathematics Course -

Paper VII- Real Analysis -II

Name of teacher – Patil R.S

Month-November- December			Module/Unit	Sub-units planned
Lectures 14	Practicals 70	Total 84	Unit-1	Sequence of Real Numbers Sequence and operations on sequence 1.1 sequence 1.2 subsequence of sequence 1.3 Illustrative example 1.4 Limit of sequence 1.5 Convergent sequence Definition, Example, Theorems. 1.6 Illustrative Examples 1.7 Bounded sequence Theorem: The sequence of real numbers $\{s_n\}$ is convergent, then $\{s_n\}$ is bounded. 1.8 Monotone sequence Definition, Theorems. 1.9 Operations on Convergent Sequence Theorems and operations of Convergent sequence. 1.10 Exercise
Month-January				
Lectures 14	Practicals 72	Total 86	Unit- 1	Limit Superior, Inferior and Cauchy Sequence Limit superior Limit Inferior Illustrate Examples Cauchy Sequence 1.19 Theorem: If X = $\{s_n\}$ is a convergent sequence of real number, then $\{s_n\}$ is Cauchy sequence. Theorem: A Cauchy sequence of real number is bounded. 1.21 Cauchy convergent criterion Theorem: A sequence of real numbers is convergent if and only if it is a Cauchy sequence 1.22 [C,1] Summability of sequence 1.23 Illustrative Examples 1.24 Exercise 1.25 Objective Questions
Month-February				
Lectures 12	Practicals 56	Total 68	Unit-2 Infinite Series	2.1 Introduction 2.2 Convergent and Divergent Series 2.3 Illustrative examples 2.4 Cauchy’s General Principle of Convergence

				2.5 Positive Term Series 2.6 Geometric Series 2.7 P-Series 2.8 Comparison Test for Positive term Series.Comparison test (First Type) Limit form of Comparison test 2.10 Comparison test (second type) 2.11 Illustrative 2.12 Cauchy's Root Test 2.13 Illustrative Example 2.14 D'Alembert's Ratio Test 2.15 Illustrative Example 2.16 Raabe's Test 2.17 Illustrative Example
			Unit-2 Infinite series	Series with Arbitrary Terms 2.18 Introduction 2.19 Alternating series
Month- March				
Lectures 11	Practicals 64	Total 75	Unit-2 Infinite Series	2.20 Leibnitz Test 2.21 Illustrative Example
Month- April				

Name & Signature of Teacher Ms.Patil R.S

Annual Teaching Plan

Academic year 2024-2025 B.Sc. Part-II Semester IV Department -Mathematics

Subject - Mathematics Course -

Paper VIII – Geometry

Name of teacher – Patil H.K

Month November -December			Module/Unit	Sub-units planned
Lectures 15	Practicals 20	Total 35	Unit-1 Lagrange's Theorem and its Consequences	Lagrange's Theorem and its Consequences Introduction Lagrange's Theorem Index of a Subgroup Illustrative Examples
Month-January				
Lectures 11	Practicals 20	Total 31	Unit-1 Lagrange's Theorem and its Consequences	Consequence of Lagrange's Theorem Exercise 1.7 Multiple Choice Questions.
Month-February				
Lectures 11	Practicals 12	Total 23	Unit-2 Normal Subgroup and Properties	Introduction Normal Subgroup Illustrative Examples Result Related to Normal Subgroups Center of Group
Month- March				
Lectures 12	Practicals 25	Total 37	Unit-2	Normalizer of an Element Factor Group 1.15 Exercise 1.16 Multiple Choice Questions
Month- April				
Lectures 12	Practicals 16	Total 28		1. Numerical Examples

Name & Signature of Teacher Ms. Rutuja S. Patil