Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Ms. A. D. Patil
Programme: M. Sc. I
Subject: Mathematics

Semester: I
Course Title: Modern Algebra

Month: July			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Simple Groups	1)Permutation group, Group of symmetry, Dihedral group, Commutator subgroups Simple groups, simplicity of An , 2) Normal and subnormal series, Jordan-Holder theorem 3) Solvable groups, Nilpotent group, isomorphism theorems (Statement only) 4) Zassenhaus Lemma, Schreier refinement theorem.
15	00	15		
Month: August			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Group Action	1) Group action on a set, isometry subgroups, Burnside theorem 2) Direct product and semidirect product of groups, Sylow theorems, p-subgroups, 3) Group of order and pq, 4)Class equation and applications
15	00	15		
Month: September			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Rings of Polynomial	1) Ring of Polynomials, Factorization of polynomials over fields, 2) Irreducible polynomials, Eisenstein criterion, ideals in F[x] 3) Unique Factorization domain, principal ideal domain 4)Gauss lemma, Euclidean Domain
15	00	15		
Month: October			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Module	1) Modules, sub-modules, quotient modules, 2) homomorphism and isomorphism theorems, fundamental theorem for modules 3) completely reducible modules, free modules.
15	00	15		

(Ms. A. D. Patil)

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964

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VIVEKANAND COLLEGE, KOLHAPUR
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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Ms. S. J. Koshti

Programme: M.Sc. I Semester: I

Subject: Mathematics Course Title: Ordinary Differential Equations

Month: July			Module/Unit:	Sub-units planned
Lectures	Practical	Total	1. Second order homogeneous Equations	1. Second order homogeneous Equations 2. Linear dependence & dependence 3. Non-homogeneous equations of order two 4. Homogeneous equations of order n
17	00	17		
Month: August			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	2. The non-homogeneous equation of n th order	1. The non-homogeneous equation of n th order 2. Linear Equations with variable Coefficients 3. Wronskian and linear dependence 4. Reduction of order of homogeneous equation
15	00	15		
Month: September			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	3. The legendre equations	1. Sturm Liouville theory 2. Homogeneous equations with analytic coefficients 3. The legendre equations 4. Linear Equations with regular singular points 5. The Euler equations
17	00	17		
Month: October			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	4. The Bessel equation	1. The Bessel equation 2. Regular singular points at infinity 3. Existence and uniqueness of solutions: The method of successive approximations 4. The Lipschitz condition
16	00	16		

Koshti

(Ms. S. J. Koshti)

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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Mr. A. A. Patil
Programme: M.Sc. I
Subject: Mathematics

Semester: I
Course Title: Measure and Integration

Month: July			Module/Unit:	Sub-units planned
Lectures	Practical	Total	1. Lebesgue Outer Measure	1) Open Sets, Closed Sets and Borel Sets 2) Lebesgue Outer Measure, The sigma algebra of Lebesgue Measurable Sets, Countable Additivity 3) Continuity and Borel-Cantelli Lemma 4) non-measurable set.
18	00	18		
Month: August			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	2. Measurable Functions	1) Sums, Product and Composition of Measurable Functions, 2) Sequential Pointwise limits and Simple Approximation. Littlewood's Three Principles 3) Egoroff's Theorem and Lusin's Theorem,Lebesgue 4) Integration of a Bounded Measurable Function, Lebesgue Integration of a Non-negative Measurable Function.
15	00	15		
Month: September			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	3. Lebesgue Integral,	1) The General Lebesgue Integral, 2) Characterization of Riemann and Lebesgue Integrability, 3) Differentiability of Monotone Functions, Lebesgue's Theorem, 4) Functions of Bounded Variations: Jordan's Theorem
17	00	17		
Month: October			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	4. Absolutely Continuous Functions	1) Absolutely Continuous Functions, 2)Integrating Derivatives: Differentiating Indefinite Integrals, 3) Normed Linear Spaces, Inequalities of Young, Holder and Minkowski, 4)The Riesz-Fischer Theorem.
15	00	15		

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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Ms. A. D. Patil
Programme: M.Sc. I
Subject: Mathematics

Semester: I
Course Title: Numerical Analysis-I

Month: August			Module/Unit:	Sub-units planned
Lectures	Practical	Total	1. Iterative solutions	1.Iterative solutions of Transcendental & polynomial equations: Bisection method, 2. Iteration methods based on First degree equation 3.Secant method, Regula Falsi method Newton Raphson
15	00	15		
Month: September			Module/Unit:	Sub-units planned
Lectures	Practical	Total	2. linear System of algebraic equations and Eigenvalue problems	1.Linear System of algebraic equations and Eigenvalue problems: Iteration methods (Jacobi iteration method, Gauss seidel iteration method) 2.Convergence analysis, Matrix factorization methods (Doo little reduction, Crout reduction), 3.Eigen values and eigenvectors, Gerschgorin theorem, Brauer theorem, Jacobi method for symmetric matrices 4. Power method.
18	00	18		

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Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Dr. S. M. Bargir
Programme: M. Sc. I
Subject: Mathematics

Semester: I
Course Title: Operational Research

<table>
<tr><td colspan="3">Month: July</td><td>Module/Unit:</td><td>Sub-units planned</td></tr>
<tr><td>Lectures</td><td>Practical</td><td>Total</td><td rowspan="2">Convex Set and LPP:</td><td rowspan="2">1)Convex set and their properties.
2)Lines, hyperplanes and polyhedral convex set and its theorems.
3)Convex combination of vectors, convex hull. Simplex and convex function.
2) General form of linear programming and Matrix form of linear programming.
3)Definition of standard LPP and theorems of it.</td></tr>
<tr><td>15</td><td>00</td><td>15</td></tr>
<tr><td colspan="3">Month: August</td><td>Module/Unit:</td><td>Sub-units planned</td></tr>
<tr><td>Lectures</td><td>Practical</td><td>Total</td><td rowspan="2">Simplex Method:</td><td rowspan="2">1) Computational procedure of simplex method. Problem of degeneracy, revised simplex method in standard form- I
2) Duality in linear programming and duality theorems.
3)Integer linear programming: Gomory's cutting plane method, Branch and Bound method.</td></tr>
<tr><td>17</td><td>00</td><td>17</td></tr>
<tr><td colspan="3">Month: September</td><td>Module/Unit:</td><td>Sub-units planned</td></tr>
<tr><td>Lectures</td><td>Practical</td><td>Total</td><td rowspan="2">Dynamic Programming:</td><td rowspan="2">1) Bellman's Principle of Optimality
2) Application of Dynamic Programming in production
3) Inventory control and linear programming.</td></tr>
<tr><td>15</td><td>00</td><td>15</td></tr>
<tr><td colspan="3">Month: October</td><td>Module/Unit:</td><td>Sub-units planned</td></tr>
<tr><td>Lectures</td><td>Practical</td><td>Total</td><td rowspan="2">Non linear Programming:</td><td rowspan="2">1) Unconstrained problems of maximum and minimum
2) Lagrangian method Kuhn Tucker necessary and sufficient conditions
3) Wolfe's method and Beale's method</td></tr>
<tr><td>16</td><td>00</td><td>16</td></tr>
</table>

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Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Dr. S. P. Thorat

Programme - M.Sc.-I | Semester-I

Subject: Mathematics | Course Title: Research Methodology

Month: July			Module/Unit: I	Sub-units planned
Lectures	Practicals	Total	Mathematical Writing	1. What is a theorem? , Proofs. The role of examples Words versus symbols. 2. Displaying Equations, Parallelism, Dos and Don'ts of Mathematical writing. 3. Writing a paper : Audience, Organization and structure, Author list, Abstract, Key words.
16	00	16		
Month: August			**Module/Unit: II**	**Sub-units planned**
Lectures	Practicals	Total	Writing a Paper	1. The introduction, Review of Literature, Computational experiments, Citations, Conclusions 2. Acknowledgements, Appendix, Reference list, specific and deprecated 3. Revising Draft: How to revise , examples of prose, examples involving equations. 4. a revised proof, A draft Article for improvement
17	00	17		
Month: September			**Module/Unit: III**	**Sub-units planned**
Lectures	Practicals	Total	Publishing a Paper	1. Choosing a Journal, Submitting a manuscript, The refereeing process , How to referee , 2. The Role of copy Editor, Checking the proofs Copyright issues 3. SIAM Journal Article : A case study 4. Writing and Defending a thesis : The purpose of a thesis, content, presentation, the thesis defence.
18	00	18		
Month: October			**Module/Unit: IV**	**Sub-units planned**
Lectures	Practicals	Total	Quality indices of research publication	1. Impact factor, H-index, science citation index. 2. Using web for literature review: Google scholar, Scopus, MathSciNet 3. Latex and Beaner for paper typing and presentations: Latex-typesetting , mathematics, typesetting theorems. Making presentations with LATEX-Beamer
16	00	16		

(Dr. S. P. Thorat)

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Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Dr. S. M. Bargir
Programme: M. Sc. II
Subject: Mathematics

Semester: III
Course Title: Functional Analysis

Month: July			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Normed Linear Spaces	1.1 Normed linear spaces, Banach spaces, Quotient spaces, Continuous linear transformations, Equivalent norms. 1.2 Finite dimensional normed spaces and properties, Conjugate space and separability. 1.3 The Hahn-Banach theorem and its Consequences.
16	00	16		
Month: August			**Module/Unit: II**	**Sub-units planned**
Lectures	Practical	Total	Second conjugate space	2.1 Second conjugate space, the natural embedding of the normed linear space in its second conjugate space. 2.2 Reflexivity of normed spaces, Weak * topology on the conjugate space. 2.3 The open mapping theorem, Projection on Banach space, the closed graph theorem. 2.4 The conjugate of an operator, the uniform boundedness principle.
15	00	15		
Month: September			**Module/Unit: III**	**Sub-units planned**
Lectures	Practical	Total	Hilbert spaces	3.1 Hilbert spaces: examples and elementary properties, Orthogonal complements. 3.2 The projection theorem, Orthogonal sets. 3.3 The Bessel's inequality, Fourier expansion and Parseval's equation, separable Hilbert spaces. 3.4 The conjugate of Hilbert space, Riesz's theorem. 3.5 The adjoint of an operator.
16	00	16		
Month: October			**Module/Unit: IV**	**Sub-units planned**
Lectures	Practical	Total	Self adjoint operators	4.1 Self adjoint operators, Normal and Unitary operators, Projections. 4.2 Eigen values and eigenvectors of an operator on a Hilbert space 4.3 The determinants and spectrum of an operator 4.4 The spectral theorem on a finite dimensional Hilbert space.
16	00	16		

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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

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Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Mr. G. B. Kolhe

Programme: M. Sc. II — Semester: III

Subject: Mathematics — Course Title: Classical Mechanics

Month: July			Module/Unit:	Sub-units planned
Lectures	Practical	Total	1 Mechanics of a particle,	1.Mechanics of a particle, Mechanics of a system of particles, conservation theorems. 2.Generalised coordinates, D' Alembert's Principle, Lagrange's equations of motion, sin applications of Lagrangian formulation 3. Kinetic energy as a homogeneous function generalised velocities, Non-conservation of total energy due to the existence of non-conservative forces. 4.Cyclic co-ordinates and generalised momentum, conservation theorems
18	00	18		
Month: August			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	2. Euler-Lagrange's equations	1.Functionals, basic lemma in calculus of variations, Euler-Lagrange's equations, first integral Euler- Lagrange's equations, the case of several dependent variables 2.Undetermined conditions, Geodesics in a plane and space, the minimum surface of revolution, the problem Brachistochrone 3. Isoperimetric problems, problem of maximum enclosed area. Hamilton's Principle, Derivation of Hamilton's principle from D'Alembert's principle, Lagrange's equation of motion from Hamilton's principle. 4.Lagrange's equations of motion for non-conservative systems (Method of Lagrange's undetermined multipliers)
15	00	15		
Month: September			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	3. Hamiltonian function	1. Hamiltonian function, Hamilton's canonical equations of motion, Derivation of Hamilt equations from variational principle 2. Physical significance of Hamiltonian, the principle of 1 action 3. cyclic co-ordinates and Routh's procedure. Orthogonal transformations 4. Properties transformation matrix, infinitesimal rotations
17	00	17		
Month: October			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	4. The Kinematics of rigid body motion	1.The Kinematics of rigid body motion: The independent co-ordinates of a rigid body, the Eule angles 2. Euler's theorem on motion of rigid body, Angular momentum and kinetic energy rigid body with one point fixed 3. the inertia tensor and moment of inertia, Euler's equations motion, Cayley- Klein parameters 4. Matrix of transformation in Cayley- Klein parametric Relations between Eulerian angles and Cayley- Klein parameters
16	00	16		

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964

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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Mr. A. A. Patil
Programme: M. Sc. II
Subject: Mathematics

Semester: III
Course Title: Complex Analysis

Month: July			Module/Unit:	Sub-units planned
Lectures	Practical	Total	1. Analytic Functions	1. Power series, radius of convergence, 2. Analytic functions, zeros of an analytic function, 4. Cauchy-Riemann equations, 5. Harmonic functions, 6. Mobius transformations
18	00	18		
Month: August			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	2. Cauchy Integral	1. Power series representation of analytical function. 2. Liouville's theorem, Fundamental theorem of algebra, 3. Maximum modulus theorem, the index of closed curve, 4. Cauchy's theorem and integral formula, Morera's theorem.
15	00	15		
Month: September			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	3. Singularities	1. Counting zero's, The open mapping theorem, Goursat's Theorem. 2. Classification of singularities, Laurent series development. 3.Casorati- weierstrass theorem.
17	00	17		
Month: October			**Module/Unit:**	**Sub-units planned**
Lectures	Practical	Total	4. Residues	1. The argument principle, Rouche's theorem the maximum principle. Schwar's lemma 2. Residues, residues and its applications to characterize conformal maps.
16	00	16		

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Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Ms. A. D. Patil
Programme: M. Sc. II Semester: III
Subject: Mathematics Course Title: Advanced Discrete Mathematics

Month: August			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Graph Theory	1.1 Graph Theory: Definition, examples and properties, Simple graph 1.2 Graph isomorphism, Bipartite graphs, Complete Bipartite graph, regular graph, sub-graphs spanning sub-graph, Edge deleted sub-graph, Vertex deleted sub-graph 1.3 Union and intersection of two graphs, complements of a graph, self complementary graph 1.4 paths and cycles in a graph, Eccentricity, radius and diameter of a connected graph 1.5 Peterson graph, Wheel graph. Isomorphism of Graphs. First theorem of graph theory
18	00	18		
Month: September			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Adjacency matrix	2.1 The Matrix representation of a graph, Adjacency matrix and Incidence matrix of a Graph 2.2 Definition and simple properties of a tree, bridges, spanning trees 2.3 Inclusion exclusion principle. 2.4 Simple examples on Inclusion exclusion principle Pigeonhole principle 2.5 Examples on Pigeonhole principle
15	00	15		

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Department of Mathematics

Academic Year: 2025-26

ANNUAL TEACHING PLAN

Name of the teacher: Ms. A. D. Patil
Programme: M. Sc. II
Subject: Mathematics

Semester: III
Course Title: Lattice Theory

Month: July			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Basic concepts	1.1 Posets, Definition and examples of posets. 1.2 Two definitions of lattices and their equivalence, examples of lattices. 1.3 Description of Lattices, some algebraic concepts. 1.4 Duality principle, Specialelements. 1.5 Homomorphism, Isomorphism and isotone maps.
18	00	18		
Month: August			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Special types of Lattices	2.1 Distributive lattices – Properties and characterizations. 2.2 Modular lattices – Properties and characterizations. 2.3 Congruence relations. 2.4 Boolean algebras – Properties and characterizations.
15	00	15		
Month: September			Module/Unit: III	Sub-units planned
Lectures	Practical	Total	Ideal theory	3.1 Ideals and filters in lattices. 3.2 Lattice of all ideals I(L). 3.3 Properties and characterizations of I(L). 3.4 Stone's theorem and its consequences.
17	00	17		
Month: October			Module/Unit: IV	Sub-units planned
Lectures	Practical	Total	Stone algebra	4.1 Pseudo complemented lattices. 4.2 S(L) and D(L) – special subsets of pseudo complemented lattices. 4.3 Distributive pseudo complemented lattice. 4.4 Stone lattices – properties and characterizations
16	00	16		

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