Amrut Sevabhavi Sanstha, Parbhani.
Late Ku. Durga K. Banmeru Science College, Lonar Dist-Buldhana.
Department of Mathematics
Teaching Plan: 2023-24

Class:-B.Sc. IstYear
Semester:- Ist
Paper:- I- Algebra & Trigonometry (CBCS)

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	Unit. I	**Matrices**		
			Various types of matrices,	04	
			Adjoint and inverse of matrix.	02	
			Elementary transformation of a matrix,	02	12
			Inverse of elementary transformation of a matrix ,	02	
			normal form of a matrix.	02	
2	Aug-Sept	Unit II	**Eigen Values & Eigen Vectors**		
			Row rank, column rank	02	
			Eigenvalues, eigenvectors, characteristic equation	04	12
			Cayley-Hamilton theorem	03	
			Inverse by Cayley-Hamilton theorem	03	
3	Sept	Unit III	**Theory of Equations**		
			Descartes rule of signs	02	
			Relations between roots and Coefficients	03	12
			Transformation of equations.	02	
			Cubic equation.	03	
			Biquadratic equation	02	
4	Oct	Unit IV	**De Moivre's Theorem .**		
			Roots of complex number.	04	
			Circular functions, Hyperbolic function,	02	12
			Inverse Hyperbolic function,	02	
			Relation between circular & hyperbolic functions.	02	
			Separation of real &imaginary parts of the circular & hyperbolic functions of complex variable.	02	
5	Nov.	Unit V	**Trigonometric series**		
			Gregory series, Euler's series	03	
			Machin series, Rutherford series	03	13
			Series based upon sinx , cosx , sinhx, coshx	03	
			Exponential Series,logarithmic series	04	

Class:-B.Sc. I[st] Year
Semester:- I[st]
Paper:- II- Differential &Integral Calculus (CBCS)

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	**Unit. I**	**Limit-**		
			Definition of Limit of function,	04	
			Basic properties of limits,	04	12
			Some standard limit	04	
2	Aug-Sept	**Unit II**	**Continuous functions**		
			Continuous and Discontinuous functions	03	
			Types of discontinuity,	02	
			Properties of continuous functions,	03	12
			Uniform continuous functions,	02	
			Properties of uniform continuous functions.	02	
3	Sept	**Unit III**	**Differentiability-**		
			Definition & examples	03	
			Successive differentiation,	03	12
			Leibnitz theorem,	02	
			Indeterminate forms	02	
			L' Hospital rule	02	
4	Oct	**Unit IV**	**Mean Value Theorem's –**		
			Rolle's theorem.	02	
			Cauchy's Mean Value theorem,	03	12
			Lagrange's mean value theorem.	02	
			Maclaurin series expansion	02	
			Taylor series expansion.	03	
5	Nov.	**Unit V**	**Integration of Irrational algebraic functions**		
			Integration of irrational algebraic function	06	
			Reduction formulae	04	13
			Walli's formulae	03	

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Class:-B.Sc. Ist Year

Semester:- IInd

Paper:- **III- Differential Equations :Ordinary & Partial (CBCS)**

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Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	**Unit. I**	**Differential equation of 1st order & 1st degree.**		
			Formation of ordinary differential equation,	01	
			Degree and order of a ordinary differential equation,	01	
			homogeneous differential equations,	02	
			Linear differential equations,	02	12
			Bernoulli's equation,	02	
			Differential equations reducible to the linear form,	02	
			exact differential equations.	02	
2	Feb-Mar	**Unit II**	Differential equations of first order & higher degree,	03	
			differential equations solvable for p, x and y,	03	12
			Clairaut's equation,	03	
			orthogonal trajectories (Cartesian and Polar form)	03	
3	Mar	**Unit III**	Linear differential equations with constant coefficients,	03	
			Complementary function of the differential equation, particular integral of the differential equation, homogeneous linear ordinary differential equations.	03 03 03	12
4	Mar-Apr	**Unit IV**	Second order differential equation,		
			Wronskian,	02	
			method of change of dependent variable,	03	12
			normal form,	02	
			method of change of independent variable,	03	
			variation by parameters.	02	
5	Apr-May	**Unit V**	Applications of ODE:		
			Electric circuit,	03	
			steady state heat flow,	02	13
			radioactive decay and carbon dating,	02	
			Newton's law of cooling,	03	
			compound interest	02	

Class:-B.Sc. IstYear
Semester:- IInd
Paper:- IV Vector Analysis & Solid Geometry (CBCS)

Sr. No.	Month	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	Jan	**Unit. I**	**Scalars and Vectors**		
				Scalar and Vector Product of three vectors.	03	
				Product of four vectors,	03	10
				Vector differentiation	03	
				Vector integration.	03	
2	Feb-Mar	Jan-Feb	**Unit II**	**Curve in Spaces**		
				Space Curves.	02	
				t, n, b vectors.	02	12
				Fundamental planes.	03	
				Curvature, Torsion,	03	
				Frenet-Serete's Formulae.	02	
3	Mar	Feb	**Unit III**	**Differential Operator & Line Integral**		
				Gradient, divergence and curl	03	
				Line integral, existence and evaluation,	03	12
				work done	03	
				Circulation	03	
4	Mar-Apr	March	**Unit IV**	**Sphere**		
				Different forms of Sphere	03	
				Plane section of sphere	02	13
				Sphere through given circle	03	
				Intersection of sphere & line	03	
				Orthogonal Sphere & Condition of orthogonality	02	
5	Apr-May	March	**Unit V**	**Cone & Cylinder**		
				The equation of a cone with a guiding curve,	03	
				cone with vertex at origin,	03	12
				Right circular cone.	03	
				Cylinder-Equation of right circular cylinder.	03	

HOD
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Teaching Plan 2023-24
Class:-B.Sc. II nd Year
Semester:- III
Paper:- V -Advanced Calculus (CBCS)

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	Unit. I	**Limit & continuity of functions of two variables-**		
			Algebra of limits and continuity,	03	
			Intermediate value property,	03	12
			Fixed point property	03	
			Taylor's theorem for function of two variables.	03	
2	Aug-Sept	Unit II	**Maxima and minima-**		
			Maxima and minima of two variables	04	
			Lagrange's multipliers method.	04	12
			Jacobians.	04	
3	Sept	Unit III	Improper Integral (Definition only),		
			Beta and Gamma functions,		
			Properties of Beta and Gamma functions,		12
			Relation between Beta and Gamma functions.		
4	Oct	Unit IV	**Series-**		
			Series of nonnegative terms,	02	
			convergence of geometric series & p-series	02	
			Comparison tests, Cauchy's integral test,	02	12
			Ratio test, Root test.	02	
			Absolute Convergence, Conditional Convergence	02	
			Leibnitz Rule ,Abel's Test, Dirichilet Test	02	
5	Nov.	Unit V	**Sequence-**		
			Definition of sequence , Uniqueness of limit,	03	
			Algebra of limit of sequence,	02	13
			Theorems on limits of sequences,	03	
			bounded and monotonic sequences,	03	
			Cauchy Sequence	02	

B.Sc. IInd Year
Semester:- III
Paper:- VI –Partial Differential Equation

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	Unit. I	**Partial Differentiation**		
			Partial Derivatives and Differentiations of real valued functions of two variables,	04	12
			Homogeneous function,	04	
			Euler's theorems on homogeneous function.	04	
2	Aug-Sept	Unit II	**Formation of PDE**		
			Partial Differential equation of the first order,	03	
			Total Differential equation (Pfaffian),	03	12
			Lagrange's method,	03	
			Some special type of equations.	03	
3	Sept	Unit III	**Partial Differential equation of second and higher order**		
			Compatible Differential equation,	03	12
			Charpit's general method of solutions,	03	
			Partial Differential equation of second and higher order,	03	
			Homogeneous and non-homogenous equation with constant coefficients.	03	
4	Oct	Unit IV	**Calculus of Variation:**		
			Functional,	03	
			Continuity of functional,	03	12
			variational problems with fixed boundaries,	03	
			Extremum of a functional.	03	
5	Nov.	Unit V	**Method of Separation of variables:**		
			Method of Separation of variables	06	
			Method of separation of variables for wave equations and heat equations in one dimension.	07	13

Class:-B.Sc. IInd Year
Semester- IVth
Paper:- VII Modern Algebra: Group & Ring (CBCS)

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	Unit. I	**Group**:		
			Definition, examples. properties	03	
			Subgroup, Cyclic Groups	03	12
			Order of generator of cyclic group	02	
			Permutation Group	02	
			Even & Odd permutation	02	
2	Feb-Mar	Unit II	**Cosets & Normal Subgroups** :		
			Cosets, Lagrange's Theorem	02	
			Normal Subgroups	03	12
			Different characterizations of normal subgroups,	02	
			Algebra of normal subgroups,	03	
			Quotient group.	02	
3	Mar	Unit III	**Homomorphism and Isomorphism:**		
			Homomorphism, Homomorphic image,	02	
			Kernel of homomorphism, Isomorphism of groups,	03	
			Fundamental theorem of homomorphism,	02	12
			Natural homomorphism.	02	
			Second &Third isomorphism theorem	02	
4	Mar-Apr	Unit IV	**Ring, Integral domain and field:**		
			Definition, examples, Properties of ring	03	
			Subring , Characteristics of a ring	03	14
			Integral domain	03	
			Field, Subfield, Prime field.	04	
5	Apr-May	Unit V	**Fundamental Concept of Number theory:**		
			Well ordering Principle,	02	
			Principle of Mathematical induction,	01	15
			Division Algorithm,	02	
			Greatest common divisor, Least common multiple,	03	
			Euclidean Algorithm,	02	
			fundamental theorem of arithmetic,	02	
			Congruence and its properties.	03	

Class:-B.Sc. II nd Year
Semester:- IV
Paper: - VIII Mechanics (CBCS)

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	**Unit. I**	Velocities and Acceleration along the co-ordinate axes,	04	12
			Radial and Transverse directions,	04	
			Tangential and Normal directions, Projectiles.	04	
2	Feb-Mar	**Unit II**	**Lagrangian Dynamics :**		12
			Constraints.	02	
			Generalised Coordinates	03	
			D'Alembert's principle	03	
			Lagrange's equations of motion.	04	
3	Mar	**Unit III**	**Central force motion :**		12
			Areal velocity	02	
			Equivalent one body problem.	03	
			Central Orbit	03	
			Virial theorem	02	
			Kepler's laws of motions	02	
4	Mar-Apr	**Unit IV**	**Coplanar forces**		12
			forces acting at a point,	03	
			triangle law of forces,	03	
			Parallel forces, Equilibrium Forces,	03	
			Lami's Theorem,	03	
			Analytical condition of equilibrium of Coplanar forces.	01	
5	Apr-May	**Unit V**	**Work and Energy**		12
			Work and Energy	04	
			virtual work,	04	
			Uniform Catenary.	04	

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Teaching Plan 2023-24
Class:-B.Sc. IIIrd Year
Semester-V[th]
Paper:-I X Mathematical Analysis

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	Unit. I	**Riemann Integral :**		
			Definition & Examples	04	
			Integrability of continuous and monotonic function	04	
			The fundamental theorem of integral calculus.	04	12
			Mean value theorems of integral calculus.	04	
2	Aug-Sept	Unit II	**Improper integrals :**		
			Types of improper integrals	04	
			Comparison Test	04	
			limit tests.	04	12
			Beta & Gamma Function	04	
3	Sept	Unit III	**Analytic functions** :		
			Continuity & differentiability of complex functions	02	
			Analytic functions.	03	
			Cauchy-Riemann equations.	03	12
			Harmonic and Conjugate functions.	02	
			Milne Thompson method	02	
4	Oct	Unit IV	**Elementary functions :**		
			Mapping by elementary functions.	03	
			Mobius transformations.	03	
			Fixed points. Cross ratio.	02	12
			Inverse points and critical points.	02	
			Conformal mappings.	02	
5	Nov.	Unit V	**Metric Spaces :**		
			Definition & examples of metric spaces.	03	13
			Neighborhoods. Limit points. Interior points.	03	
			Open and closed sets.	03	
			Cauchy sequences.	02	
			Completeness	02	

Class:-B.Sc. III rd Year
Semester:- V
Paper:- X- Mathematical Methods

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Aug	Unit. I	**Legendre's equation :**		
			Legendre's equation and Polynomials	02	
			Recurrences relations	03	12
			Generating functions.	03	
			Orthogonality of Legendre's Polynomial	02	
			Rodrigue's Formula	02	
2	Aug-Sept	Unit II	**Bessel's equation**		
			solution of Bessel's equation	03	
			Recurrences relations	03	12
			Generating functions	03	
			Sturm- Liouville boundary value problem	03	
3	Sept	Unit III	**Fourier Series :**		
			Fourier Series -introduction	02	
			Fourier series of Even and odd function.	02	08
			Half-range fourier sine series	02	
			Half-range fourier cosine series	02	
4	Oct	Unit IV	**Laplace transform:**		
			Laplace transform of some elementary functions	02	
			Existence of Laplace transform	02	12
			Properties of Laplace transform	02	
			Laplace transform of Derivatives and Integral	02	
			Inverse Laplace transform	02	
			Convolution theorem	01	
			Application of Laplace Transform	01	
5	Nov.	Unit V	**Fourier Transform :**		
			Finite Fourier sin transform	02	
			Inverse finite Fourier sin transform	03	
			Inverse finite Fourier cosin transform	02	13
			Infinite Fourier transform	02	
			Infinite Fourier sin transform and cosin transform	02	
			Properties of Fourier transform	02	

Class:-B.Sc. IIIrd Year
Semester-VIth
Paper:- XI Linear Algebra

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	Unit. I	**Vector Space :**		
			Definition and example of vector spaces.	02	
			Subspaces. Sum and direct sum of subspaces.	02	
			Linear span. Linear dependence,	02	13
			Independence and their basic properties.	02	
			Basis , Finite dimensional vector spaces .	02	
			Existence theorem for bases.	01	
			Invariance of the number of elements of a basis set.	01	
			Dimension.	01	
2	Feb-Mar	Unit II	**Linear Transformations**		
			Linear transformation & their representation as matrices.	04	
			Algebra of linear transformations.	03	12
			The rank nullity theorem.	02	
			Change of basis.	02	
3	Mar	Unit III	**Dual Spaces**		
			Dual space. Bidual space and natural isomorphism.	04	
			Adjoint of a linear transformation.	04	12
			Eigen values and eigenvectors of a linear transformation.	04	
4	Mar-Apr	Unit IV	**Inner Product Spaces**		
			Inner product spaces. Cauchy-Schwarz inequality.	03	
			Orthogonal vectors. Orthogonal complements.	03	
			Orthonormal sets and bases.	02	12
			Bessel's inequality for finite dimensional spaces.	02	
			Gram Schmidt Orthogonalisation process.	02	
5	Apr-May	Unit V	**Modules**		
			Modules, Submodules,	04	12
			Quotient modules.	04	
			Homomorphism	02	
			Isomorphism	02	

Class:-B.Sc. IIIrd Year
Semester-VIth
Paper:- XII Special Theory of Relativity

Sr. No.	Month	Unit	Name of Unit & Topics	Required Lect.	Total Lect.
1	Jan-Feb	Unit. I	**Review of Newtonian Mechanics:**		
			Inertial frames. Speed of light and Galilean relativity	02	
			Relative character of space and time	02	
			Postulates of Special theory of relativity	02	12
			Lorentz Transformations	02	
			geometrical interpretation of L.T	02	
			Group properties of transformation	02	
2	Feb-Mar	Unit II	**Relativistic Kinematics:**		
			Composition of parallel velocities.	02	
			Length contraction. Time Dilation	02	
			Transformation equation for components of velocities	02	12
			Transformation equation acceleration of a particle	02	
			Lorentz contraction factor.	02	
3	Mar	Unit III	**Geometrical representation of Space-Time:**		
			4D Minkowskian space-time of relativity.	03	
			Time, Light Like& space like intervals. Proper time.	03	12
			Four vector and tensors in Minkowskian space-time.	03	
			Operation on Tensors,Outer Product,Inner Product	03	
4	Mar-Apr	Unit IV	**Relativistic Mechanics:**		
			Variation of mass with velocity	02	
			Equivalence of mass and energy.	03	12
			Transformation equ. for mass, momentum & energy.	02	
			Relativistic force & transf^n equn for its components.	03	
			Relativistic Lagrangian and Hamiltonian.	02	
5	Apr-May	Unit V	**Electromagnetism:**		
			Maxwell's equation in vacuum.	02	
			Propagation of electric and magnetic field strengths.	02	13
			Transformation equation for electromagnetic four potential vector.	02	
			Transformation equation for electric & magnetic field strengths.	02	
			Gauge transformation. Maxwell's equation	03	
			Lorentz force on a charged particle.	02	

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