D.B.F. Dayanand College of Arts and Science, Solapur
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.I	
NAME OF SUBJECT	: MATHEMATICS	
SEM I / II / III / IV / V / VI	: SEM I	
COURSE NUMBER (PAPER NUMBER)	: PAPER I	
TITLE OF COURSE (NAME OF PAPER)	: ALGEBRA	
COURSE CONTENT	OBJECTIVES	OUTCOME
Matrices Symmetric and Skew symmetric, Elementary transformations, Rank of a Matrix(Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. **Linear Equations** Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Eigen values and Eigen vectors. **Complex Number** Modulus and Argument of a Complex Number, DeMoivre's theorem and its applications, Roots of Unity, Roots of Complex Numbers. **Transcendental Functions** Circular Functions and their inverses and Hyperbolic function of a complex variable with their inverses.	1. To introduce to student about types of matrices, rank of a matrix. 2. To introduce to student about solution of simultaneous equations, Eigen values and Eigen vectors. 3. To introduce to student about complex numbers, DeMoivre's theorem and its applications roots of unity and roots of complex number. 4. To introduce to student about circular functions and their inverses, hyperbolic functions of a complex number.	1. The Students are able to use techniques for solving matrices. 2. The Students are able to use matrices techniques for solving system of linear equations, Eigen values and Eigen vectors. 3. The Students are able to use techniques for solving complex roots of unity. 4. The student can understood the transcendental functions

D.B.F. Dayanand College of Arts and Science, Solapur
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.I
NAME OF SUBJECT	: MATHEMATICS
SEM I / II / III / IV / V / VI	: SEM I
COURSE NUMBER (PAPER NUMBER)	: PAPER II
TITLE OF COURSE (NAME OF PAPER)	: CALCULUS

COURSE CONTENT	OBJECTIVES	OUTCOME
Differentiation: Indeterminate forms and L' Hospital's Rule, Successive differentiations, nth derivatives of standard functions, Leibnitz rule. Taylor's theorem and Maclaurin's Theorem (Only Statements). Series expansions of e^{x}, cos x, sin x, $(1+x)^{n}$, log(1+x). **Function of two variables:** Limit and Continuity of functions of two variables, Partial derivative, partial derivative of higher orders, Homogeneous functions, Euler's theorem on Homogeneous functions. **Reduction formulae:** $\int_0^{\frac{\pi}{2}} sin^n x\, dx,$ $\int_0^{\frac{\pi}{2}} cos^n x\, dx, \int_0^{\frac{\pi}{2}} sin^n x\, cos^m x dx$ **Vector Calculus:** Scalar point function, Vector point function , Directional derivative, Gradient , divergence and Curl and its properties.	1. To introduce to student about Indeterminate forms of limit , L' Hospital's Rule, Successive differentiations, nth derivatives of standard functions, Leibnitz rule. Taylor's theorem and Maclaurin's Theorem. 2. To introduce to student about limits and continuity of two variables, partial derivatives and its higher orders , homogeneous functions, Euler's theorem. 3. To introduce to student about integration of sine and cosine formulae for higher degree. 4. To introduce to student about vector differentiation with vector differential operator.	1. The Students can express the power series expansion of a given function and evaluate limits. 2. The Students will able to solve limits, partial derivatives of functions of two variables. 3. The Students are able to use techniques for solving integration of sine and cosine. 4. The Students will able to use different vector differential operator.

D.B.F. Dayanand College of Arts and Science, Solapur
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.I	
NAME OF SUBJECT	: MATHEMATICS	
SEM I / II / III / IV / V / VI	: SEM II	
COURSE NUMBER (PAPER NUMBER)	: PAPER III	
TITLE OF COURSE (NAME OF PAPER)	: GEOMETRY	
COURSE CONTENT	OBJECTIVES	OUTCOME
Change of Axis Translations, Rotations, Invariants, Identifications of conics from general form of second degree equations, Polar Coordinates, Conversion formulae. **Plane** General equation of plane, Normal equation, Intercept form Angle between two planes, Plane through three points, Plane through a given point, Sides of a plane, Distance of a point from a plane, Family of planes. **Sphere** Centre radius form, General form , Diameter form, Equation of Tangent Plane and condition for tangency, Family of spheres $S+\lambda S'=0$, $S+\lambda P=0$.	1.To introduce to student about change of axis. 2. To introduce to student about plane. 3. To introduce to student about sphere.	1. The student will understood the change of axis. 2. The student will understood the plane. 3. The student will understood the sphere.

D.B.F. Dayanand College of Arts and Science, Solapur
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.I	
NAME OF SUBJECT	: MATHEMATICS	
SEM I / II / III / IV / V / VI	: SEM I	
COURSE NUMBER (PAPER NUMBER)	: PAPER IV	
TITLE OF COURSE (NAME OF PAPER)	: DIFFERENTIAL EQUATION	
COURSE CONTENT	OBJECTIVES	OUTCOME
Differential Equations of first order and first degree:[Part-I] Variables separable, Homogeneous, non- homogeneous differential equations. **Differential Equations of first order and first degree :[Part-II]** Exact differential equations. Necessary and sufficient condition for exactness, Integrating factor with four rules, Linear differential equations of the form: $\frac{dy}{dx} + Py = Q$ Bernoulli's Equation $\frac{dy}{dx} + Py = Qy^n$ **Linear Differential Equations With Constant Coefficients :[Part-I]** Complementary function and particular integral, General solution of f(D) y=X, Solution of f(D)y=0 for non-repeated , repeated, real and complex root. **Linear Differential Equations With Constant Coefficients : [Part-II]** Solution of f(D)y=X , where X is of the form e^{ax}, sin(ax), cos(ax), x^m, , e^{ax}, V, xV	1. To introduce to student about some method to find solutions of first order and first degree. 2. To introduce to student about some method to find solutions of first order and first degree. 3. To introduce to student about some method to find solutions of Linear differential equations with constant coefficients. 4. To introduce to student about some method to find solutions of Linear differential equations with constant coefficients.	1.The Students will able to solve first order and first degree. 2. The Students will able to solve first order and first degree. 3. The Students will able to use techniques for solving Linear differential equations with constant coefficients. 4.The Students will able to use techniques for solving Linear differential equations with constant coefficients.

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
COURSE OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : III		
COURSE NUMBER (PAPER NUMBER) : PAPER : V		
TITLE OF COURSE (NAME OF PAPER) : Differential Calculus		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Tangents and Normals: Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, subtangent, subnormal at any point of a curve, Pedal equations or p, r equations (Cartesian form), Angle between radius vector and tangent, Length of the perpendicular from pole to the tangent, Length of polar subtangent and polar sub-normal, Pedal equations (polar form), Derivative of length of an arc(Cartesian form), Derivative of arc length(Polar Formula) and Other formulae.	To introduce a students how to find area between arc and angle of intersection between two curve.	Students can understood how to find area between arc and angle of intersection between two curve.
Curvature : Definition of Curvature ,Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations.	To introduce a students about curvature, how to solve examples of curvature.	Students can understood application of curvature.
Jacobians: Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only).	To introduce a students about Jacobian and implicit function	Students can understood applications of jacobian
Maxima and Minima: Definiton of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values(Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives. Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers of two variables.	To introduce student about maxima and minima and methods	Students can understood how find maximum and minimum value of the function

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
COURSE OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : III		
COURSE NUMBER (PAPER NUMBER) : PAPER : VI		
TITLE OF COURSE (NAME OF PAPER) : Real Analysis		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Real Numbers: Introduction, Field Structure and Order Structure Bounded and Unbounded Sets Supremum, Infimum Completeness in the Set of Real Numbers, Absolute Value of a Real Number	To introduce a students about Real number and Set theory.	Students can understoo Set theory and real number.
Real Sequences : Sequences, Limit Points of a Sequence, Limit Inferior and Superior, Convergent Sequnces, Nonconvergent Sequences(Definitions), Cauchy's General Principle of Convergence, Algebra of Sequences, Some Important Theorems, Monotonic Sequences	To introduce a students about real sequence and how to show the sequence is convergent.	Students can understood real sequence and how to show the sequence is convergent.
Infinite Series: Introduction, Positive Term Series, Comparison Tests for Positive Term Series, Cauchy's Root Test, D'Alembert's Ratio Test, Raabe's Test (Only Statement and Examples), Logarithmic Test(Only Statement and Examples)	To introduce a students about infinite series and how to show the series is convergent.	Students can understood infinite series and how to show the series is convergent.

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
COURSE OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : IV		
COURSE NUMBER (PAPER NUMBER) : PAPER : VII		
TITLE OF COURSE (NAME OF PAPER) : Differential Equations		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Differential Equations of the first order and of degree higher than the first : Equations that can be resolved into factors of the first degree, Equations solvable for x, Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form.	To introduce a students what is differential equation and how to get a solution of differential equation.	Students can understood what is differential equation and how to get a solution of differential equation.
Linear Equations of the second order : General form of the second order linear equation, Complete solution when one integral belonging to complementary function is known ,Rules of getting an integral belonging to complementary function , Removal of the First order Derivative. Transformation of the linear equation of second order by Changing the independent variable.	To introduce a students what is linear equation of second order and how to get a solution of linear equation.	Students can understood what is linear equation of second order and how to get a solution of linear equation.
Homogeneous linear equation: Homogeneous linear equations, Working rule for finding the solution, Equations reducible to Homogeneous form.	To introduce a students what is Homogeneous linear equation of second order and how to get a solution of Homogeneous linear equation.	Students can understood what is Homogeneous linear equation of second order and how to get a solution of Homogeneous linear equation.

Simultaneous Equations & Total Differential Equations: Nature of the solution of simultaneous equations, Rules of solving the Equation, Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness , Method of Solving the Equation.	To introduce a students about Simultaneous equation of and Total Differential equation and nature of solution of Simultaneous equation and method of solving the equation.	Students can understood Simultaneous equation of and Total Differential equation and nature of solution of Simultaneous equation and method of solving the equation.

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : IV		
COURSE NUMBER (PAPER NUMBER) : PAPER : VIII		
TITLE OF COURSE (NAME OF PAPER) : Abstract Algebra		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Introduction to Groups: Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.	To introduce a students about Group and examples.	Students can understood Group and examples.
Equivalence, Congruence,Divisibilty: Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.	To introduce a students about Equivalence, Congruence, Divisibilty and examples.	Students can understood Equivalence, Congruence, Divisibilty and examples.
Groups: Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.	To introduce a students about properties of Group some theorems of group.	Stuidents can understood properties of Group some theorems of group.
Group Homomorphism: Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.	To introduce a students about Group Homomorphism and examples.	Students can understood Group Homomorphism and examples.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC.	: B.SC.III
NAME OF SUBJECT	: MATHEMATICS
SEM I / II / III / IV / V / VI	: SEM V
COURSE NUMBER (PAPER NUMBER)	: PAPER IX
TITLE OF COURSE (NAME OF PAPER)	: ALGEBRA-II

COURSE CONTENT	OBJECTIVES	OUTCOME
Introduction to Rings Definitions and Examples, Integral Domains, Subrings , Fields , Isomorphism, Characteristic of rings **Quotient Rings** Homomorphism of rings, ideals Quotient Rings **Vector Spaces** Vector spaces, subspaces, linear combination and system of linear equation, linear dependence and independence, basis and dimensions **Linear transformation and matrices** Linear transformation, null spaces and range, matrix representation of linear transformation, composition of linear transformation and matrix multiplication, invertibility and isomorphism **Inner product space** Inner products and Norms.	1. To introduce to students Ring Theory ,To give knowledge about Isomorphism. 2. To introduce to students Quotient Group & Quotient Ring. 3. To introduce to students Space, To give knowledge about Vector Spaces. 4. To introduce to students Matrices, Transformation ,To give knowledge about Linear Transformation and Matrix Transformation. 5. To introduce to students Inner Product Space,And to give them Knowledge about Norms and distances	1. Students are apply the Ring Theory in Real Life. 2. Students Can understood Ideals,Quotient Ring. 3. Students can Understood the Spaces. 4. Students are able to use matrices technique for solving Linear Equation. 5. Students can understood the Norms, Distance.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. : B.SC.III		
NAME OF SUBJECT : : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER X		
TITLE OF COURSE (NAME OF PAPER) : COMPLEX ANALYSIS		
COURSE CONTENT	OBJECTIVES	OUTCOME
Analytic Functions Complex Differentiation, Limits and Continuity, Differentiability Necessary and sufficient condition of analytic function, Method of constructing a regular function and analytic function, Simple method of constructing analytic function, Polar from of Cauchy-Riemann Equations. **Complex Integration** Introduction, Some basic definitions, Complex integral,Reduction ofcomplex integrals to real integrals, Some properties of complex Integrals, An estimation of a complex integral, Line integrals as functions of arcs, Cauchy's Fundamental Theorem (Theorem-I), Cauchy Goursat Theorem [Statement Only], Cauchy's Integral formula [Statement only], its consequences and examples, Derivative and higher order derivatives of an analytic function [Statement(s) only] and examples, Expansions of Analytic functions as power series (Taylor's Maclaurin's and Laurent's Series [Statement only]) and its examples, The zeros of an analytic function, Different Types of Singularities, Some Theorems on Poles and other Singularities (Theorem-I to IV only) and its examples, The point at infinity **Calculus of Residues** Residue at simple pole, Residue at a Pole of order greater than unity, Residue at infinity, Cauchy's Residue Theorem. Evaluation of Definite integrals, Integration round the unit Circle. Evaluation of $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$.	1. To introduce to students about some method to check analytic function. 2. To introduce to students about some theorems on the analytic function. 3. To introduce to students about pole and singularity.	1. The students can able to use technique for checking the analytic function. 2.The students will understood for checking the analytic function. 3. The students will understood for checking the analytic function.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. : B.SC.III		
NAME OF SUBJECT : : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER XI		
TITLE OF COURSE (NAME OF PAPER) : INTEGRAL CALCULUS		
COURSE CONTENT	OBJECTIVES	OUTCOME
Improper Integrals: Convergence of Improper integrals of the first kind, Test of convergence of a (Positive integrands), Necessary and sufficient condition for the convergence of improper integrals, Comparison of two integrals, A practical comparison test, Useful comparison integrals, Two useful tests, f(x) not necessarily positive general test for convergence, Absolute and conditionally convergence, Convergence of improper integrals of the second kind, Convergence at infinity (Integrand being positive), Comparison of two integrals, A useful comparison integrals, General test (for convergence at infinity and f(x) may be positive or negative), Cauchy's test for convergence, Absolute and conditionally convergence of improper integrals of second kind, Test for the absolute convergence of the integral of product, Abel's test, Dirichlet's test. **Beta and Gamma function :** Definition, Properties, Transformations of Gamma function and Beta function and relation between them, Some important deductions, Duplication formula. **Multiple integrals :** Double Integrals, Cartesian and polar, Applications of Double Integration (Area of regions and Volume of a Solid only), Change of order of integration, Change of Variables.	1. To introduce to students about improper integral and familiar with convergence of improper integral. 2. To introduce to students about Beta and Gamma function. 3. To introduce to students about Multiple integrals.	1. The students can able to use technique for checking convergence of improper integral. 2. The students can able to use technique for Solving Beta and Gamma function. 3. The students can able to use technique to solve multiple integral.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER XII		
TITLE OF COURSE (NAME OF PAPER) : PARTIAL DIFFERENTIAL EQUATION (Elective-A)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Linear Partial differential equation of order one: Formation of partial differential equation by eliminating arbitraryconstants , Formation of partial differential equation by eliminating arbitraryfunctions ,Types of integrals of partial differential equation , Lagrange's Method of solving linear partial differential equation of order one namely $Pp + Qq = R$ (Working rule for solving $Pp+Qq =R$ by Lagrange's Method), Integral surface passing through a given curve **Non Linear partial differential equation of order one** Solution of first order partial differential equation by Charpit's Method, Special methods of solution applicable to certain standard form I, II, III, IV. **Linear partial differential equation with constant Coefficient**: Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient working rule for finding complementary function (C.F.), method of finding particular integral (P.I.) , Short method when f (x, y) is $\varphi(ax + by)$ and $x^m y^n$	1. To introduce to students methods of find solution for first order linear partial differential equation. 2. To introduce to students methods of find solution for first order non linear partial differential equation. 3. To introduce to students methods of find solution for Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient.	1. Students will be able to solve first order linear partial differential equation. 2. Students will be able to solve first order non linear partial differential equation. 3. Students will be able to solve Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC.	: B.SC.III
NAME OF SUBJECT :	: MATHEMATICS
SEM I / II / III / IV / V / VI	: SEM V
COURSE NUMBER (PAPER NUMBER)	: PAPER XII
TITLE OF COURSE (NAME OF PAPER) (ELECTIVE - B)	: MATHEMATICAL ANALYSIS

COURSE CONTENT	OBJECTIVES	OUTCOME
Functions of a Single Variable (I) : Limits, Continuous functions, Functions continuous on closed intervals, Uniform continuity **Functions of a Single Variable (II) :** The Derivative, Continuous functions, Increasing and decreasing Functions, Darboux's Theorem, Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Higher Order Derivatives **Functions :** Power series, Exponential functions, Logarithmic functions, Trigonometric functions, Functional equations, Functions of bounded variation, Vector - Valued functions	1. To introduce to students about limit, continuous functions and uniform continuity. 2. To introduce to students about Functions of a Single Variable. 3. To introduce to students about Functions.	1. Students will get an idea about limit, continuous functions and uniform continuity. 2. Students will understood Functions of a Single Variable. 3. Students will understood Functions.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. : B.SC.III		
NAME OF SUBJECT : : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XIII		
TITLE OF COURSE (NAME OF PAPER) : METRIC SPACES		
COURSE CONTENT	OBJECTIVES	OUTCOME
Limits and metric Spaces The Class l^2 (Schwartz, Minkowski inequality), Limit of a function on the real line, Metric Spaces , Limits in metric spaces. **Continuous functions on metric spaces** Functions continuous at a point on the real line, Reformulation, Function continuous on a metric space , Open Sets, Closed Sets **Completeness and Compactness** More about open sets, Bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces.	1. To introduce to students about Limits and metric Spaces. 2. To introduce to students about Continuous functions on metric spaces. 3. To introduce to students about Completeness and Compactness	1. Students will understood Limits and metric Spaces. 2. Students will understood Continuous functions on metric spaces. 3. Students will understood Completeness and Compactness

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC.	B.SC.III

NAME OF SUBJECT :	MATHEMATICS	
SEM I / II / III / IV / V / VI	SEM VI	
COURSE NUMBER (PAPER NUMBER) :	PAPER XIV	
TITLE OF COURSE (NAME OF PAPER) :	NUMERICAL ANALYSIS	
COURSE CONTENT	OBJECTIVES	OUTCOME
Finite Differences Introduction, Finite differences, Differences of Polynomial, Relation between the operators **Interpolation** Introduction, Newton's forward interpolation formula, Newton's backward interpolation formula, Central difference interpolation formula, Gauss's forward interpolation formula, Gauss's backward interpolation formula, Stirling's formula, Interpolation with unequal Intervals, Lagrange's Interpolation Formula **Numerical Differentiation and Integration** Numerical differentiation, Formula for derivatives, Maxima and minima of a tabulated function, Numerical Integration, Quadrature formulae (Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 th rule) **Difference Equations** Introduction, Definitions, Formation of difference equations, Linear difference equation, Rules for finding the Complementary function, Rules for finding the Particular Integral, Difference equations reducible to linear form	1. To introduce to students about Finite Differences. 2. To introduce to students about Interpolation. 3. To introduce to students about Numerical Differentiation and Integration. 4. To introduce to students about Difference Equations	1. Students will understood Finite Differences. 2. Students will understood Interpolation. 3. Students will Understood Numerical Differentiation and Integration. 4. Students will understood Difference Equations

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

PROGRAM SUBJECT OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

NAME OF SUBJECT :	MATHEMATICS	
SEM I / II / III / IV / V / VI	SEM VI	
COURSE NUMBER (PAPER NUMBER) :	PAPER XV	
TITLE OF COURSE (NAME OF PAPER) :	PROGRAMMING IN C	
COURSE CONTENT	OBJECTIVES	OUTCOME
Overview of C. Introduction, Importance of C, Sample C programs, Basic structure of C programs, Programming style, Executing a C program, Points to remember	1. To introduce to students concept of algorithm for problem solving. 2. To introduce to students about Constants, Variables and Data Types . 3. To introduce to students about operators and expressions. 4. To introduce to students about Managing Input and Output Operators	1. Students will be able to design flowchart / algorithm for given problem. 2. Students will be able to design Constants, Variables and Data Types. 3. Students will be able to design operators and expressions. 4. Students will be able to understood Managing Input and Output Operators
Constants, Variables and Data Types Introduction, Character Set, C Token, Constants, Keywords and Identifiers, Variables, Data Types, Declaration of variables, Assigning values to variables, Defining symbolic constants		
Operators and Expressions Introduction , Arthmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increments and decrement operators, Conditional operators, Bit-wise operators, Special operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expressions, Operators precedence and associativity, Mathematical function		
Managing Input and Output Operators Introduction, Reading a character, Writing a character, Formatted input , Formatted output		
Decision Making and Branching Introduction, Decision making with IF statement, Simple IF statement, The IF…ELSE Statement, Nesting of If….ELSE Statement, The ELSE…. IF ladder,	5. To introduce to students about fundamental structures. 6. To introduce to students about Decision Making	5. Students will be able to design fundamental structures. 6. Students will be able to design Decision Making

The SWITCH Statement, The ? : operator, The GOTO statement	structures and Looping structures.	structures and Looping structures.
Decision Making and Looping Introduction, The WHILE Statement, The DO Statement, The FOR Statement, Jumps in loops	7. To introduce to students about arrays.	7. Students will be able to design arrays.
Arrays Introduction, One dimensional arrays, Two dimensional arrays, Initialising two dimensional arrays, Multidimensional arrays	8. To introduce to students about User - defined Functions.	8. Students will be able to design User - defined Functions.
User - defined Functions Introduction, Need for user - defined functions, A multifunction program, The form of C Functions, Return values and their types		

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

PROGRAM SUBJECT OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XVI		
TITLE OF COURSE (NAME OF PAPER) : INTEGRAL TRANSFORMS (ELECTIVE - A)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Laplace Transform. Integral Tansform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of F(t), Laplace Transform of the n^{th}order derivatives of F(t), Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t, Multiplication by t_n, Division by t, Evalution of Integrals, periodic functions.	1. To introduce to students Laplace Transform. 2. To introduce to students Inverse Laplace Transform. 3. To introduce to students Application of Laplace Transforms**.**	1. Students will Understood Laplace Transform. 2. Students will Understood Inverse Laplace Transform. 3. Students will Understood Application of Laplace Transforms**.**
The Inverse Laplace Transform. Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p, Division by powers of p, Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.		
Application of Laplace Transforms. Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients, Simultaneous ordinary differential equations, Partial		

differential equations.		

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

PROGRAM SUBJECT OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC.	B.SC.III	
NAME OF SUBJECT :	MATHEMATICS	
SEM I / II / III / IV / V / VI	SEM VI	
COURSE NUMBER (PAPER NUMBER) :	PAPER XVI	
TITLE OF COURSE (NAME OF PAPER) : GRAPH THEORY AND COMBINATORICS (ELECTIVE-B)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Graph Introduction, Basic terminology, Simple graph, Multigraph and Psuedograph, Degree of a vertex, types of graph.	1. To introduce to students Graph. 2. To introduce to students about Colorings of Graph. 3. To introduce to students about Planar graph. 4. To introduce to students Combinatorics, Applications of Inclusion Exclusion Principle.	1. Students will Understood Graph. 2. Students will Understood Colorings of Graph. 3. Students will Understood Planar graph. 4. Students will Understood Combinatorics, Applications of Inclusion Exclusion Principle.
Colorings of graph Vertex Coloring - evaluation of vertex chromatic number of some standard graphs, critical graph. Upper and lower bounds of Vertex chromatic Number - Statement of Brooks theorem. Edge coloring - Evaluation of edge chromatic number of standard graphs such as complete graph, complete bipartite graph, cycle, Statements of Vizing Theorem. Chromatic polynomial of graphs - Recurrence Relation and properties of Chromatic polynomials. Vertex and Edge cuts vertex and edge connectivity and the relation between vertex and edge connectivity. Equality of vertex and edge connectivity of cubic graphs. Whitney's theorem on 2 - vertex connected graphs.		
Planar graph Definition of planar graph. Euler formula and its consequences. Non-planarity of K5, K(3,3). Dual of a graph. Polyhedran in R and existence of exactly five regular polyhedral-(Platonic solids) Colorability of planar graphs - 5 color theorem for planar graphs, statement of 4 color theorem. Networks and flow and cut in a network - value of a flow and the capacity of cut in a network, relation between flow and cut.		

Maximal flow and minimal cut in a network and Ford-Fulkerson theorem.		
Combinatorics Applications of Inclusion Exclusion Principle - Rook Polynomial, Forbidden position problems Introduction to partial franctions and using Newton's binomial theorem for real power find series, expansion of some standard functions. Forming recurrence relation and getting a generating function. Solving a recurrence relation using ordinary generating functions. System of Distinct Representatives and Hall's theorem of SDR. Introduction to matching, M alternating and M augmenting path, Berge theorem. Bipartite graphs.		

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : III		
COURSE NUMBER (PAPER NUMBER) : PAPER : V		
TITLE OF COURSE (NAME OF PAPER) : Differential Calculus		
COURSE CONTENT	OBJECTIVES	OUTCOME
Tangents and Normals: Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, subtangent, subnormal at any point of a curve, Pedal equations or p, r equations (Cartesian form), Angle between radius vector and tangent, Length of the perpendicular from pole to the tangent, Length of polar subtangent and polar sub-normal, Pedal equations (polar form), Derivative of length of an arc (Cartesian form), Derivative of arc length(Polar Formula) and Other formulae. **Curvature :** Definition of Curvature ,Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. **Jacobians:** Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). **Maxima and Minima:**Definiton of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values(Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives. Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers of two variables.	1. To introduce a students how to find area between arc and angle of intersection between two curve. 2. To introduce a students about curvature, how to solve examples of curvature. 3. To introduce a students about Jacobian and implicit function. 4. To introduce student about maxima and minima and methods.	1. Students can understood how to find area between arc and angle of intersection between two curve. 2. Students can understood application of curvature. 3. Students can understood applications of jacobian. 4. Students can understood how find maximum and minimum value of the function

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.II		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI : SEM : III		
COURSE NUMBER (PAPER NUMBER) : PAPER : VI		
TITLE OF COURSE (NAME OF PAPER) : Real Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
Real Numbers: Introduction, Field Structure and Order Structure Bounded and Unbounded Sets Supremum, Infimum Completeness in the Set of Real Numbers, Absolute Value of a Real Number **Real Sequences :** Sequences, Limit Points of a Sequence, Limit Inferior and Superior, Convergent Sequnces, Nonconvergent Sequences(Definitions), Cauchy's General Principle of Convergence, Algebra of Sequences, Some Important Theorems, Monotonic Sequences **Infinite Series:** Introduction, Positive Term Series, Comparison Tests for Positive Term Series, Cauchy's Root Test, D'Alembert's Ratio Test, Raabe's Test (Only Statement and Examples), Logarithmic Test(Only Statement and Examples)	1.To introduce a students about Real number and Set theory. 2. To introduce a students about real sequence and how to show the sequence is convergent. 3. To introduce a students about infinite series and how to show the series is convergent.	1. Students can understood Set theory and real number. 2. Students can understood real sequence and how to show the sequence is convergent. 3. Students can understood infinite series and how to show the series is convergent.

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
PROGRAM SUBJECT OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.II
NAME OF SUBJECT	: MATHEMATICS
SEM I / II / III / IV / V / VI	: SEM : IV
COURSE NUMBER (PAPER NUMBER)	: PAPER : VII
TITLE OF COURSE (NAME OF PAPER)	: Differential Equations

COURSE CONTENT	OBJECTIVES	OUTCOME
Differential Equations of the first order and of degree higher than the first : Equations that can be resolved into factors of the first degree, Equations solvable for x, Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form. **Linear Equations of the second order :** General form of the second order linear equation, Complete solution when one integral belonging to complementary function is known ,Rules of getting an integral belonging to complementary function , Removal of the First order Derivative. Transformation of the linear equation of second order by Changing the independent variable. **Homogeneous Linear Equation:** Homogeneous linear equations, Working rule for finding the solution, Equations reducible to Homogeneous form. **Simultaneous Equations & Total Differential Equations:** Nature of the solution of simultaneous equations, Rules of solving the Equation, Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness , Method of Solving the Equation.	1. To introduce a students what is differential equation and how to get a solution of differential equation. 2. To introduce a students what is linear equation of second order and how to get a solution of linear equation. 3. To introduce a students what is Homogeneous linear equation of second order and how to get a solution of Homogeneous linear equation. 4. To introduce a students about Simultaneous equation of and Total Differential equation and nature of solution of Simultaneous equation and method of solving the equation.	1.Students can understood what is differential equation and how to get a solution of differential equation. 2. Students can understood what is linear equation of second order and how to get a solution of linear equation. 3. Students can understood what is Homogeneous linear equation of second order and how to get a solution of Homogeneous linear equation. 4. Students can understood Simultaneous equation of and Total Differential equation and nature of solution of Simultaneous equation and method of solving the equation.

D.B.F.DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR
COURSE OUTCOME
NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc.II
NAME OF SUBJECT	: MATHEMATICS
SEM I / II / III / IV / V / VI	: SEM : IV
COURSE NUMBER (PAPER NUMBER)	: PAPER : VIII
TITLE OF COURSE (NAME OF PAPER)	: Abstract Algebra

COURSE CONTENT	OBJECTIVES	OUTCOME
Introduction to Groups: Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry. **Equivalence, Congruence,Divisibilty:** Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function. **Groups:** Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem. **Group Homomorphism:** Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.	1. To introduce a students about Group and examples. 2. To introduce a students about Equivalence, Congruence, Divisibilty and examples. 3. To introduce a students about properties of Group some theorems of group. 4. To introduce a students about Group Homomorphism and examples.	1. Students can understood Group and examples. 2. Students can understood Equivalence, Congruence, Divisibilty and examples. 3. Students can understood properties of Group some theorems of group. 4. Students can understood Group Homomorphism and examples.

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	B.Sc.I
NAME OF SUBJECT	MATHEMATICS
SEM I / II / III / IV / V / VI	SEM I
COURSE NUMBER (PAPER NUMBER)	PAPER I
TITLE OF COURSE (NAME OF PAPER)	ALGEBRA

COURSE CONTENT	OBJECTIVES	OUTCOME
Matrices Symmetric and Skew symmetric, Elementary transformations, Rank of a Matrix(Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix.	To introduce to student about types of matrices, rank of a matrix	The Students are able to use techniques for solving matrices.
Linear Equations Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Eigen values and Eigen vectors.	To introduce to student about solution of simultaneous equations, Eigen values and Eigen vectors.	The Students are able to use matrices techniques for solving system of linear equations, Eigen values and Eigen vectors.
Complex Number Modulus and Argument of a Complex Number, DeMoivre's theorem and its applications, Roots of Unity, Roots of Complex Numbers.	To introduce to student about complex numbers, DeMoivre's theorem and its applications roots of unity and roots of complex number.	The Students are able to use techniques for solving complex roots of unity.
Transcendental Functions Circular Functions and their inverses and Hyperbolic function of a complex variable with their inverses.	To introduce to student about circular functions and their inverses, hyperbolic functions of a complex number.	The student can understood the transcendental functions

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	B.Sc.I
NAME OF SUBJECT	MATHEMATICS
SEM I / II / III / IV / V / VI	SEM I
COURSE NUMBER (PAPER NUMBER)	PAPER II
TITLE OF COURSE (NAME OF PAPER)	CALCULUS

COURSE CONTENT	OBJECTIVES	OUTCOME
Differentiation Indeterminate forms and L' Hospital's Rule, Successive differentiations, nth derivatives of standard functions, Leibnitz rule. Taylor's theorem and Maclaurin's Theorem (Only Statements). Series expansions of e^x, cos x, sin x, $(1+x)^n$, log(1+x).	To introduce to student about Indeterminate forms of limit , L' Hospital's Rule, Successive differentiations, nth derivatives of standard functions, Leibnitz rule. Taylor's theorem and Maclaurin's Theorem.	The Students can express the power series expansion of a given function and evaluate limits.
Function of two variables Limit and Continuity of functions of two variables, Partial derivative, partial derivative of higher orders, Homogeneous functions, Euler's theorem on Homogeneous functions.	To introduce to student about limits and continuity of two variables, partial derivatives and its higher orders , homogeneous functions, Euler's theorem.	The Students will able to solve limits, partial derivatives of functions of two variables.
Reduction formulae $\int_0^{\frac{\pi}{2}} sin^n x\, dx,$ $\int_0^{\frac{\pi}{2}} cos^n x\, dx, \int_0^{\frac{\pi}{2}} sin^n x\, cos^m x dx$	To introduce to student about integration of sine and cosine formulae for higher degree.	The Students are able to use techniques for solving integration of sine and cosine
Vector Calculus Scalar point function, Vector point function , Directional derivative, Gradient , divergence and Curl and its properties.	To introduce to student about vector differentiation with vector differential operator.	The Students will able to use different vector differential operator.

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	B.Sc.I
NAME OF SUBJECT	MATHEMATICS
SEM I / II / III / IV / V / VI	SEM II
COURSE NUMBER (PAPER NUMBER)	PAPER III
TITLE OF COURSE (NAME OF PAPER)	GEOMETRY

COURSE CONTENT	OBJECTIVES	OUTCOME
Change of Axis Translations, Rotations, Invariants, Identifications of conics from general form of second degree equations, Polar Coordinates, Conversion formulae.	To introduce to student about change of axis.	The student will understood the change of axis.
Plane General equation of plane, Normal equation, Intercept form Angle between two planes, Plane through three points, Plane through a given point, Sides of a plane, Distance of a point from a plane, Family of planes.	To introduce to student about plane.	The student will understood the plane.
Sphere Centre radius form, General form , Diameter form, Equation of Tangent Plane and condition for tangency, Family of spheres $S+\lambda S'=0$, $S+\lambda P=0$.	To introduce to student about sphere.	The student will understood the sphere.

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.Sc. / M.A. / M.Sc.	B.Sc.I
NAME OF SUBJECT	MATHEMATICS
SEM I / II / III / IV / V / VI	SEM I
COURSE NUMBER (PAPER NUMBER)	PAPER IV
TITLE OF COURSE (NAME OF PAPER)	DIFFERENTIAL EQUATION

COURSE CONTENT	OBJECTIVES	OUTCOME
Differential Equations of first order and first degree:[Part-I] Variables separable, Homogeneous, non- homogeneous differential equations.	To introduce to student about some method to find solutions of first order and first degree.	The Students will able to solve first order and first degree.
Differential Equations of first order and first degree :[Part-II] Exact differential equations. Necessary and sufficient condition for exactness, Integrating factor with four rules, Linear differential equations of the form: $\frac{dy}{dx} + Py = Q$ Bernoulli's Equation $\frac{dy}{dx} + Py = Qy^n$	To introduce to student about some method to find solutions of first order and first degree.	The Students will able to solve first order and first degree.
Linear Differential Equations With Constant Coefficients :[Part-I] Complementary function and particular integral, General solution of f(D) y=X, Solution of f(D)y=0 for non-repeated , repeated, real and complex root.	To introduce to student about some method to find solutions of Linear differential equations with constant coefficients.	The Students will able to use techniques for solving Linear differential equations with constant coefficients
Linear Differential Equations With Constant Coefficients : [Part-II] Solution of f(D)y=X , where X is of the form e^{ax}, sin(ax), cos(ax), x^m, , e^{ax}, V, xV	To introduce to student about some method to find solutions of Linear differential equations with constant coefficients.	The Students will able to use techniques for solving Linear differential equations with constant coefficients.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER IX		
TITLE OF COURSE (NAME OF PAPER) : ALGEBRA-II		
COURSE CONTENT	OBJECTIVES	OUTCOME
Introduction to Rings Definitions and Examples, Integral Domains, Subrings , Fields , Isomorphism, Characteristic of rings	To introduce to students Ring Theory ,To give knowledge about Isomorphism	Students are apply the Ring Theory in Real Life.
Quotient Rings Homomorphism of rings, ideals Quotient Rings	To introduce to students Quotient Group & Quotient Ring	Students Can understood Ideals,Quotient Ring
Vector Spaces Vector spaces, subspaces, linear combination and system of linear equation, linear dependence and independence, basis and dimensions	To introduce to students Space, To give knowledge about Vector Spaces	Students can Understood the Spaces
Linear transformation and matrices Linear transformation, null spaces and range, matrix representation of linear transformation, composition of linear transformation and matrix multiplication, invertibility and isomorphism	To introduce to students Matrices, Transformation ,To give knowledge about Linear Transformation and Matrix Transformation	Students are able to use matrices technique for solving Linear Equation
Inner product space Inner products and Norms.	To introduce to students Inner Product Space,And to give them Knowledge about Norms and distances	Students can understood the Norms, Distance

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER X		
TITLE OF COURSE (NAME OF PAPER) : COMPLEX ANALYSIS		
COURSE CONTENT	OBJECTIVES	OUTCOME
Analytic Functions Complex Differentiation, Limits and Continuity, Differentiability Necessary and sufficient condition of analytic function, Method of constructing a regular function and analytic function, Simple method of constructing analytic function, Polar from of Cauchy-Riemann Equations.	To introduce to students about some method to check analytic function.	The students can able to use technique for checking the analytic function.
Complex Integration Introduction, Some basic definitions, Complex integral, Reduction of complex integrals to real integrals, Some properties of complex Integrals, An estimation of a complex integral, Line integrals as functions of arcs, Cauchy's Fundamental Theorem (Theorem-I), Cauchy Goursat Theorem [Statement Only], Cauchy's Integral formula [Statement only], its consequences and examples, Derivative and higher order derivatives of an analytic function [Statement(s) only] and examples, Expansions of Analytic functions as power series (Taylor's Maclaurin's and Laurent's Series [Statement only]) and its examples, The zeros of an analytic function, Different Types of Singularities, Some Theorems on Poles and other Singularities (Theorem-I to IV only) and its examples, The point at infinity	To introduce to students about some theorems on the analytic function.	The students will understood for checking the analytic function.

Calculus of Residues Residue at simple pole, Residue at a Pole of order greater than unity, Residue at infinity, Cauchy's Residue Theorem. Evaluation of Definite integrals, Integration round the unit Circle. Evaluation of $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$.	To introduce to students about pole and singularity.	The students will understood for checking the analytic function.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER XI		
TITLE OF COURSE (NAME OF PAPER) : INTEGRAL CALCULUS		
COURSE CONTENT	OBJECTIVES	OUTCOME
Improper Integrals: Convergence of Improper integrals of the first kind, Test of convergence of a (Positive integrands), Necessary and sufficient condition for the convergence of improper integrals, Comparison of two integrals, A practical comparison test, Useful comparison integrals, Two useful tests, f(x) not necessarily positive general test for convergence, Absolute and conditionally convergence, Convergence of improper integrals of the second kind, Convergence at infinity (Integrand being positive), Comparison of two integrals, A useful comparison integrals, General test (for convergence at infinity and f(x) may be positive or negative), Cauchy's test for convergence, Absolute and conditionally convergence of improper integrals of second kind, Test for the absolute convergence of the integral of product, Abel's test, Dirichlet's test**.**	To introduce to students about improper integral and familiar with convergence of improper integral.	The students can able to use technique for checking convergence of improper integral.
Beta and Gamma function Definition, Properties, Transformations of Gamma function and Beta function and relation between them, Some important deductions, Duplication formula**.**	To introduce to students about Beta and Gamma function.	The students can able to use technique for Solving Beta and Gamma function.

Multiple integrals Double Integrals, Cartesian and polar, Applications of Double Integration (Area of regions and Volume of a Solid only), Change of order of integration, Change of Variables.	To introduce to students about Multiple integrals.	The students can able to use technique to solve Multiple integrals.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER XII		
TITLE OF COURSE (NAME OF PAPER) : PARTIAL DIFFERENTIAL EQUATION (Elective-A)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Linear Partial differential equation of order one Formation of partial differential equation by eliminating arbitrary constants , Formation of partial differential equation by eliminating arbitrary functions ,Types of integrals of partial differential equation , Lagrange's Method of solving linear partial differential equation of order one namely $Pp + Qq = R$ (Working rule for solving $Pp+Qq =R$ by Lagrange's Method), Integral surface passing through a given curve	To introduce to students methods of find solution for first order linear partial differential equation.	Students will be able to solve first order linear partial differential equation.
Non Linear partial differential equation of order one Solution of first order partial differential equation by Charpit's Method, Special methods of solution applicable to certain standard form I, II, III, IV.	To introduce to students methods of find solution for first order non linear partial differential equation.	Students will be able to solve first order non linear partial differential equation.
Linear partial differential equation with constant Coefficient Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient working rule for finding complementary function (C.F.), method of finding particular integral (P.I.) , Short method when f (x, y) is φ (ax + by) and $x^m y^n$	To introduce to students methods of find solution for Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient.	Students will be able to solve Homogeneous and Non Homogeneous linear partial differential equation with constant coefficient.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM V		
COURSE NUMBER (PAPER NUMBER) : PAPER XII		
TITLE OF COURSE (NAME OF PAPER) : MATHEMATICAL ANALYSIS (ELECTIVE - B)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Functions of a Single Variable (I) Limits, Continuous functions, Functions continuous on closed intervals, Uniform continuity	To introduce to students about limit, continuous functions and uniform continuity.	Students will get an idea about limit, continuous functions and uniform continuity.
Functions of a Single Variable (II) The Derivative, Continuous functions, Increasing and decreasing Functions, Darboux's Theorem, Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Higher Order Derivatives	To introduce to students about Functions of a Single Variable.	Students will understood Functions of a Single Variable.
Functions Power series, Exponential functions, Logarithmic functions, Trigonometric functions, Functional equations, Functions of bounded variation, Vector - Valued functions	To introduce to students about Functions.	Students will understood Functions.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XIII		
TITLE OF COURSE (NAME OF PAPER) : METRIC SPACES		
COURSE CONTENT	OBJECTIVES	OUTCOME
Limits and metric Spaces The Class l^2 (Schwartz, Minkowski inequality), Limit of a function on the real line, Metric Spaces , Limits in metric spaces.	To introduce to students about Limits and metric Spaces.	Students will understood Limits and metric Spaces.
Continuous functions on metric spaces Functions continuous at a point on the real line, Reformulation, Function continuous on a metric space , Open Sets, Closed Sets	To introduce to students about Continuous functions on metric spaces.	Students will understood Continuous functions on metric spaces.
Completeness and Compactness More about open sets, Bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces.	To introduce to students about Completeness and Compactness	Students will understood Completeness and Compactness

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC.	B.SC.III	
NAME OF SUBJECT :	MATHEMATICS	
SEM I / II / III / IV / V / VI	SEM VI	
COURSE NUMBER (PAPER NUMBER) :	PAPER XIV	
TITLE OF COURSE (NAME OF PAPER) :	NUMERICAL ANALYSIS	
COURSE CONTENT	OBJECTIVES	OUTCOME
Finite Differences Introduction, Finite differences, Differences of Polynomial, Relation between the operators	To introduce to students about Finite Differences	Students will understood Finite Differences
Interpolation Introduction, Newton's forward interpolation formula, Newton's backward interpolation formula, Central difference interpolation formula, Gauss's forward interpolation formula, Gauss's backward interpolation formula, Stirling's formula, Interpolation with unequal Intervals, Lagrange's Interpolation Formula	To introduce to students about Interpolation	Students will understood Interpolation
Numerical Differentiation and Integration Numerical differentiation, Formula for derivatives, Maxima and minima of a tabulated function, Numerical Integration, Quadrature formulae (Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 th rule)	To introduce to students about Numerical Differentiation and Integration	Students will Understood Numerical Differentiation and Integration
Difference Equations Introduction, Definitions, Formation of difference equations, Linear difference equation, Rules for finding the Complementary function, Rules for finding the Particular Integral, Difference equations reducible to linear form	To introduce to students about Difference Equations	Students will understood Difference Equations

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XV		
TITLE OF COURSE (NAME OF PAPER) : PROGRAMMING IN C		
COURSE CONTENT	OBJECTIVES	OUTCOME
Overview of C. Introduction, Importance of C, Sample C programs, Basic structure of C programs, Programming style, Executing a C program, Points to remember	To introduce to students concept of algorithm for problem solving.	Students will be able to design flowchart / algorithm for given problem
Constants, Variables and Data Types Introduction, Character Set, C Token, Constants, Keywords and Identifiers, Variables, Data Types, Declaration of variables, Assigning values to variables, Defining symbolic constants	To introduce to students about Constants, Variables and Data Types	Students will be able to design Constants, Variables and Data Types
Operators and Expressions Introduction , Arthmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increments and decrement operators, Conditional operators, Bit-wise operators, Special operators, Arithmetic expressions, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expressions, Operators precedence and associativity, Mathematical function	To introduce to students about operators and expressions.	Students will be able to design operators and expressions.
Managing Input and Output Operators Introduction, Reading a character, Writing a character, Formatted input , Formatted output	To introduce to students about Managing Input and Output Operators	Students will be able to understood Managing Input and Output Operators

Decision Making and Branching Introduction, Decision making with IF statement, Simple IF statement, The IF…ELSE Statement, Nesting of If….ELSE Statement, The ELSE…. IF ladder, The SWITCH Statement, The ? : operator, The GOTO statement	To introduce to students about fundamental structures.	Students will be able to design fundamental structures.
Decision Making and Looping Introduction, The WHILE Statement, The DO Statement, The FOR Statement, Jumps in loops	To introduce to students about Decision Making structures and Looping structures	Students will be able to design Decision Making structures and Looping structures
Arrays Introduction, One dimensional arrays, Two dimensional arrays, Initialising two dimensional arrays, Multidimensional arrays	To introduce to students about arrays.	Students will be able to design arrays.
User - defined Functions Introduction, Need for user - defined functions, A multifunction program, The form of C Functions, Return values and their types	To introduce to students about User - defined Functions.	Students will be able to design User - defined Functions.

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XVI		
TITLE OF COURSE (NAME OF PAPER) : INTEGRAL TRANSFORMS (ELECTIVE - A)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Laplace Transform. Integral Tansform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of F(t), Laplace Transform of the n^{th}order derivatives of F(t), Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t, Multiplication by t_n, Division by t, Evalution of Integrals, periodic functions.	To introduce to students Laplace Transform.	Students will Understood Laplace Transform.
The Inverse Laplace Transform. Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p, Division by powers of p, Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.	To introduce to students Inverse Laplace Transform.	Students will Understood Inverse Laplace Transform.
Application of Laplace Transforms.	To introduce to students	Students will

Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients, Simultaneous ordinary differential equations, Partial differential equations.	Application of Laplace Transforms**.**	Understood Application of Laplace Transforms**.**

D.B.F. DAYANAND COLLEGE OF ART'S AND SCIENCE, SOLAPUR.

COURSE OUTCOME

NAME OF DEPARTMENT : MATHEMATICS

B.A. / B.SC. / M.A. / M.SC. B.SC.III		
NAME OF SUBJECT : MATHEMATICS		
SEM I / II / III / IV / V / VI SEM VI		
COURSE NUMBER (PAPER NUMBER) : PAPER XVI		
TITLE OF COURSE (NAME OF PAPER) : GRAPH THEORY AND COMBINATORICS (ELECTIVE-B)		
COURSE CONTENT	OBJECTIVES	OUTCOME
Graph Introduction, Basic terminology, Simple graph, Multigraph and Psuedograph, Degree of a vertex, types of graph.	To introduce to students Graph	Students will Understood Graph
Colorings of graph Vertex Coloring - evaluation of vertex chromatic number of some standard graphs, critical graph. Upper and lower bounds of Vertex chromatic Number - Statement of Brooks theorem. Edge coloring - Evaluation of edge chromatic number of standard graphs such as complete graph, complete bipartite graph, cycle, Statements of Vizing Theorem. Chromatic polynomial of graphs - Recurrence Relation and properties of Chromatic polynomials. Vertex and Edge cuts vertex and edge connectivity and the relation between vertex and edge connectivity. Equality of vertex and edge connectivity of cubic graphs. Whitney's theorem on 2 - vertex connected graphs.	To introduce to students about Colorings of Graph.	Students will Understood Colorings of Graph.
Planar graph Definition of planar graph. Euler formula and its consequences. Non-planarity of K5, K(3,3). Dual of a graph. Polyhedran in R and existence of exactly five regular polyhedral- (Platonic solids) Colorability of planar graphs - 5 color theorem for planar graphs, statement of 4 color theorem.	To introduce to students about Planar graph.	Students will Understood Planar graph.

Networks and flow and cut in a network - value of a flow and the capacity of cut in a network, relation between flow and cut. Maximal flow and minimal cut in a network and Ford-Fulkerson theorem.		
Combinatorics Applications of Inclusion Exclusion Principle - Rook Polynomial, Forbidden position problems Introduction to partial franctions and using Newton's binomial theorem for real power find series, expansion of some standard functions. Forming recurrence relation and getting a generating function. Solving a recurrence relation using ordinary generating functions. System of Distinct Representatives and Hall's theorem of SDR. Introduction to matching, M alternating and M augmenting path, Berge theorem. Bipartite graphs.	To introduce to students Combinatorics, Applications of Inclusion Exclusion Principle.	Students will Understood Combinatorics, Applications of Inclusion Exclusion Principle.