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.

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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.

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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.

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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.

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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.

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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.
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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		

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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.		

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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.		