

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

SEMESTER :III

**PAPER - I : ADVANCED CALCULUS AND DIFFERENTIAL
EQUATIONS - I**


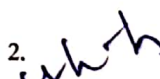


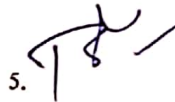
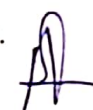
Max. Marks: 80;Min.Marks:28

Hours 45;Credit-3

- UNIT I** Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison test. Cauchy's integral test. Ratio test. Raabe's, logarithmic, De-Morgan and Bertrand's test.
- UNIT II** Continuity. Sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives. Taylor's theorem with various forms of remainders.
- UNIT III** Limit and continuity of functions of two variables. Partial differentiation change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for function of two variables. Mean value theorems for functions of two variables
- UNIT IV** Series solutions of differential equations. Power series method. Bessel and Legendre function and their properties, Convergence, recurrence and generating relations. Orthogonality of functions. Sturm - Liouville problem.
- UNIT V** Laplace transformation - Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.

REFERENCES:

1. Gorakh Prasad: Differential Calculus, Pothishalas Pvt Ltd, Allahabad.
2. Gorakh Prasad: Integral Calculus, Pothishalas Pvt Ltd, Allahabad.
3. Shanti Narayan: Differential Calculus, S. Chand & Co. New Delhi
4. Shanti Narayan: Integral Calculus, S. Chand & Co. New Delhi
5. Khalil Ahmad: Text Book of Calculus, World Education Publishers, 2012.
6. S.C.Malik: Mathematical Analysis, Wiley Eastern Ltd., New Delhi

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

**SEMESTER :IV PAPER : ADVANCED CALCULUS AND
DIFFERENTIAL EQUATIONS-II**

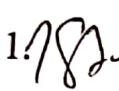
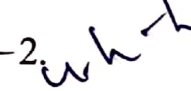

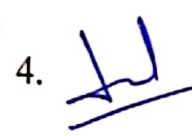


Max. Marks: 80;Min.Marks:28

Hours 45;Credit-3

- UNIT I** Envelopes. Evolutes. Maxima , Minima and saddle points of functions of two variables. Lagrange's multiplier method..
- UNIT II** Beta and Gamma functions. Double and triple integrals. Dirichlet's integral. Change of Order of integration in double integrals.
- UNIT III** Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.
- UNIT IV** Partial differential equation of second and higher orders. Classification of linear partial differential equations of second order.Homogeneous and non - homogeneous equations with constant coefficients. Partial differential equation reducible to equations with constant coefficient.
- UNIT V** Calculus of Variations - Variational problems with fixed boundaries, Euler's equations for functionals containing first order derivatives and one independent variable. Extremals. Functional dependent on higher order derivatives. Functionals dependent on more than one dependent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.

REFERENCES:

1. C. H. Edwards and D. E. Penny, D E and BVP Pearson education, India 2005.
2. Dennis G. Zill, A first course in differential equations,
3. S. L. Ross: Differential equations, John Wiley and Sons, 2004.
4. Zafar Ahsan: Text Book of Differential Equations and their Applications, PHI
5. Khalil Ahmad: Text Book of Differential Equations, World Education Publishers, 6. D.A.
6. A.S. Gupta: Calculus of variations with applications, Prentice Hall of India, 1997.
8. I.N. Sneddon: Elements of Partial Differential Equations, McGraw Hill Company, 1988.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

SEMESTER :V

PAPER : ANALYSIS AND ABSTRACT ALGEBRA-I

Max. Marks: 80;Min.Marks:28

Hours 45;Credit-3

REAL ANALYSIS

UNIT I Series of arbitrary terms, Convergence, divergence and oscillation. Abel's and Dirichlet's tests. Multiplication of series, Double series. Partial derivation and Differentiability of real - valued functions of two variables. Schwartz and Young's theorem, Implicit function theorem, Fourier series.

UNIT II Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests, Abel's and Dirichlet's tests.

COMPLEX ANALYSIS


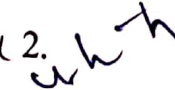


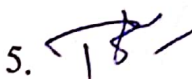

UNIT III Complex numbers as ordered pairs. Geometric representation of Complex numbers. , Continuity and differentiability of complex functions. Analytic functions. Cauchy-Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions.

UNIT-IV Ring theory-Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean Rings. Polynomial Rings. Polynomials over the Rational Field. The Eisenstein criterion. Polynomial Rings over Commutative Rings. Unique factorization domain. R unique factorization domain implies so is $R(x_1, x_2, \dots, x_n)$.

UNIT-V Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space.

REFERENCES:

1. R. G. Bartle and D.R. Sherbert, Introduction to Real Analysis 3rd ed, John Wiley and Sons
2. S.C. Malik and Savita Arora: Mathematical Analysis, New Age (P) Ltd. Publishers, 1996.
3. Sudhir R Ghorpade and Balmohan V. Limaye, Calculus and Real Analysis, Springer
4. T.M. Apostol: Mathematical Analysis, Addison-Wesley Series in Mathematics, 1974.
5. R.R. Goldberg: Real Analysis, Oxford IBH Publishing, New Delhi, 1970.
6. Shanti Narayan : Theory of Functions of Complex Variable, S, Chand & Co. Delhi

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

SEMESTER :VI

Paper (DSE(i)) : – ANALYSIS AND ABSTRACT ALGEBRA-II

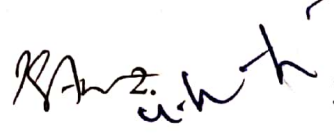




Max. Marks: 80;Min.Marks:28

Hours 45;Credit-3

-
- UNIT I** Definition and examples of metric spaces. Neighbourhoods. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points. Sub-space of a metric space. Cauchy sequences. Completeness. Cantor's intersection theorem. Contraction principle.
- UNIT II** Dense subsets. Baire Category theorem. Separable. Second countable and first countable spaces. Continuous functions. Equivalent metrics. Compactness. Sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and compact sets.
- UNIT-III** Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism.
- UNIT IV** :Eigen values and eigen vectors of a linear transformation. Diagonalisation. Annihilator of a sub space. Bilinear, Quadratic and Hermitian forms.
- UNIT-V** Inner Product Spaces. Cauchy Schwarz inequality. Orthogonal complements. Orthogonal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.
-

REFERENCES:

- 1 I. N. Herstein: Topics in Algebra, Wiley; 2nd edition (June 20, 1975).
- 2 P.B. Bhattacharya, S. K. Jain and S. R. Nagpaul: First course in Abstract Algebra. Cambridge Univ. Press .
- 3 K. B. Datta: Matrix and Linear Algebra. PHI, New Delhi.

1.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

SEMESTER :VI

Paper(DSE(ii)) :Programming in C and Numerical Analysis

(Theory+Practical)

Max. Marks: 50+30

Hours 45;Credit-3

PROGRAMMING IN C

Unit I: Programmer's model of a computer. Flow charts, Algorithm, Data types, Arithmetic and input/output instructions. Decisions control structure, Decision statements, Logical and conditional operators, Loop , Case Control Structures.

UNIT II: Functions, Recursions, Preprocessors, Arrays. Puppetling of strings. Structures. Pointers. File formatting.

NUMERICAL ANALYSIS

UNIT III :Solution of Equations : Bisection, Secant, Regula Falsi, Newton's Method, Roots of Polynomials :

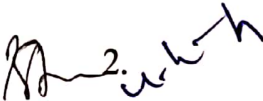
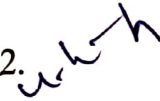

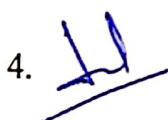
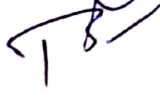

Interpolation: Lagrange and Hermite Interpolation, Divided Differences, Difference Schemes, Interpolation Formula using Differences. Numerical Differentiation. Numerical Quadrature : Newton-Cote's Formulas, Gauss Quadrature Formulas, Chebychev's Formulas.

UNIT IV: Linear Equations : Direct Methods for Solving. Systems of Linear Equations (Guass Elimination, LU Decomposition, Cholesky Decomposition), Iterative Methods (Jacobi, Gauss-Seidel, Relaxation Methods). The Algebraic Eigenvalue problem: Jacobi's Method, Givens' Method, Householder's Method, Power Method, QR Method, Lanczos' Method.

UNIT V: Ordinary Differential Equations : Euler Method, Single-step Methods, Runge-Kutta's Method, Multi-step Method's, Milne-Simpson Method, Methods Based on Numerical Integration, Methods Based on Numerical Differentiation, .

REFERENCES:

1. J.B.Dixit: Programming in C and Numerical Analysis:: Laxmi Publications,New Delhi.
2. S..S..Sastry :Scope asin Introductory Methods of Numerical Analysis,, P HI(4thEdition..).
3. G.. ShankarRao: Numerical Analysis , New Age International Publishers,,Hyderabad..
4. H..C.. Saxena :Finite Differences and Numerical Analysis , S..Chand and Company,,
5. Yashwant Kanetkar :Programming in C – BPB Publication.
6. Venugopal :Mastering C , Tata McGraw Hill Co. Ltd.
7. Kemigham and Ritche: The C Programming Language - [Prentice Hall].
8. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods , New Age International, 1999.
9. C.F. Gerald, P.O. Wheatley, Applied Numerical Analysis, Addison-Wesley, 1998.
10. S. D. Conte, C de Boor, Elementary Numerical Analysis, McGraw-Hill, 1980.
11. C.E. Froberg, Introduction to Numerical Analysis, (Second Edition), Addition-Wesley,
12. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan Publishing

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)



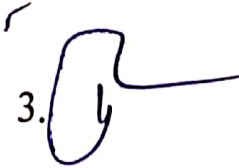



Session 2022-23

**Paper (DSE (II)): PROGRAMMING IN C AND NUMERICAL ANALYSIS
(Practical)**

Max. Marks: 30

LIST OF PRACTICAL TO BE CONDUCTED.

1. Write a program in C to find out the largest of three integer numbers.
 2. Write a program in C that reads a year and determine whether it is a leap year or not.
 - 3.. Write a program in C to calculate and print the first n terms of Fibonacci series using looping statement.
 - 4.. Write a program in C that reads a number in single digit. It determines whether the First number contains the digit or not.
 5. Write a program in C to generate first n prime numbers.
 6. Write a program in C to computes the roots of a quadratic equation using switch statements.
 7. Write a program in C to check whether a number is odd or even..
 - 8.. Write a program in C to find the sum of all the digits of a given number using recursion.
 9. Write a program in C to calculate the factorial of a given number using recursion.
 10. Write a program in C to calculate and print the multiplication of given 2D matrices.
 11. Write a program in C to calculate the area of a triangle of the given height and base.
 12. Write a C program to compute the sum of a given series.
 13. Write a program in C to determine the grade of all students in the class using Structure.
 14. Write a program in C to calculate the simple interest.
 15. Write a program in C to sort an array of integers using a function.
-

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P.G. COLLEGE BILASPUR(C.G.)

Session 2022-23

B.Sc. MATHEMATICS

SEMESTER :VI

PAPER (DSE)(iii) MATHEMATICAL MODELLING

Max. Marks: 80;Min.Marks:28

Hours 45;Credit-3

UNIT-I Setting up first-order differential equations - Qualitative solution sketching.
Difference and differential equation growth models.

UNIT-II Single-species population models. Population growth-An age structure model.
The spread of Technological innovation.






UNIT-III Higher-order linear models- A model for the detection of diabetes. Combat
models. Traffic models - Car following models Equilibrium speed distributions.

UNIT-IV Nonlinear population growth models. Prey-Predator models. Epidemic
growth models. Models from political science - Proportional representation-
cumulative voting, comparison voting.

UNIT-V Applications in Ecological and Environmental subject areas' Urban waste
water management planning.

REFERENCES:

1. Differential equation models, Eds. Martin Braun, C S Coleman, DA. Drew-
2. Political and Related Models, Steven. J. Brams, WF Lucas, PD Sraflin (Eds)
3. Discrete and System models, W.F. Lucas, F.S. Roberts, R.N4 Thrall,
4. Life Science Models. H.M. Roberts & M. Thompson.
5. All volumes published as models in applied Mathematics, Springer-Verlag, 1982.
6. Mathematical Modelling by J.N. Kapur, New Age International, New Delhi.

1.  2.  3.  4.  5.  6. 