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

DEPARTMENT OF MATHEMATICS

SYLLABUS

FOR

New curriculum of B. Sc. (Pass Course)

SEMESTER SYSTEM

2019-20

Under
Choice Based Credit System

Semester I-VI

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

B. Sc. Mathematics

Syllabus for Semester System

FIRST SEMESTER

CODE	COURSE	MARKS	
101	CALCULUS AND ALGEBRA -I	100	

SECOND SEMESTER

CODE	COURSE	MARKS	
201	CALCULUS AND ALGEBRA -II	100	

THIRD SEMESTER

CODE	COURSE	MARKS	
301	ADVANCED CALCULUS AND DIFFERENTIAL EQUATIONS -I	100	

FOURTH SEMESTER

CODE	COURSE	MARKS	
401	ADVANCED CALCULUS AND DIFFERENTIAL EQUATIONS -II	100	

FIFTH SEMESTER

CODE	COURSE	MARKS	
501	ANALYSIS AND ABSTRACT ALGEBRA-I	100	

SIXTH SEMESTER

CODE	COURSE	MARKS	
601	DSE (i)ANALYSIS AND ABSTRACT ALGEBRA-II	100	
602	DSE(ii)Programmin in C and Numerical Analysis	100	
603	DSE (iii) MATHEMATICAL MODELLING	100	

External Marks :80 Internal Marks : 20 for each paper.

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Session 2019-20

B.Sc. MATHEMATICS SEMESTER :I

PAPER : CALCULUS AND ALGEBRA -I

Max. Marks: 80;Min.Marks:28 **Hours 45;Credit-3**

UNIT I ε–δ Definition of the limit of a function. Continuity and classification of Discontinuities. Differentiability, Successive differentiation, Leibnitz theorem,

UNIT II Maclaurin's and Taylor's series expansions , Asymptotes, Curvature, Tracing of a curves in cartesian and polar coordinates.

UNIT III **De Moivres theorem and its applications,Direct and inverse circular and hyperbolic functions,Logarithm of a complex quantity,Expansion of Trignometric functions.**

UNIT IV **Relation between the roots and coefficients of general polynomial equations in one variable,Transformation of equations,Descarte's rule of signs,Solutions of cubic equatios(Cardons method),Biquadratic equation.**

UNIT V Vector differentiation and Vector integration, Directional derivatives, Gradient, Divergence , & Curl , Solenoidal and Irrotational vector.

REFERENCES:

1. Gorakh Prasad: Differential Calculus, Pothishalas Pvt Ltd, Allahabad.
2. Khalil Ahmad: Text Book of Calculus, World Edu. Pub., 2012. International (P) Ltd. Pub.
3. I. N. Herstein: Topics in Algebra, Wiley; 2nd edition (June 20, 1975).
4. P.B. Bhattacharya, S. K. Jain and S. R. Nagpaul: First course in Abstract Algebra.
5. K. B. Datta: Matrix and Linear Algebra.
6. J. Finkbecner: Matrix theory.
7. S. Singh, Modern Algebra, Vikas Publ. House, India.
8. Shanti Narayan : Differential Calculus, S.Chand Co. Ltd., Delhi,
9. Trignometry:S.L.Loney, Macmillam Pvt.Ltd.

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Session 2019-20

B.Sc. MATHEMATICS

SEMESTER :II

PAPER : CALCULUS AND ALGEBRA-II

Max. Marks: 80;Min.Marks:28 **Hours 45;Credit-3**

UNIT I Reduction formulae, Quadrature ,Rectification.

UNIT II Differential equations of first order and first degree. Linear differential equations, Exact differential equations. First orderand higher degree equations, Geometrical meaning of differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients.

UNIT III Linear differential equations of second order. Transformation of the equation by changing the dependent /independent variable, Method of variation of parameters, Ordinary simultaneous differential equations.

UNIT IV Mapping, Equivalence relations and patitions,Congruence modulo n. Definition of a group with examples and simple properties, Subgroup, Union and Intersection of a subgroup ,Generation of groups,Cyclic groups,Order of a group, Coset Decomposition. Lagrange's Theorem(only for finite group) and its consequences.

UNIT V Homomorphim and Isomorphism, ,Kernel of a Homomorphism. Normal subgroup, Quotient group. Fundamental theorem of Homomorphism,The Isomorphism Theorem for groups.Definition with examples and Properties of ring.

REFERENCES:

1. Gorakh Prasad: Integral Calculus, Pothishalas Pvt Ltd, Allahabad.

2. Shanti Narayan: Integral Calculus, S. Chand & Co.

3.S.Balachandra Rao &H.R.Anuradha,DE with App and Programmes,Uni.Press,Hyderabad.

4. R.S. Senger, Ordinary Differential Equations with Integration, Prayal Publ. 2000.

5. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India),67

6.. E.A. Codington, An Introduction to Ordinary Differential Equations, P HI, 1961.

7. B.Rai, D.P.Choudhary,Ordinary Differential Equations, Narosa Publ. 2004,

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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. Theorms 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 differentation change of varibles. 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. Differentation 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

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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 cofficient.

UNIT V Calculus of Variations - Variational problems with fixed boundaries, Euler's equations for functionals containing first order derivatives and one independent varialbe. 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.

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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 $R(x_1, x_2 ..... x_n)$.

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

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Session 2019-20

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. Continous 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.

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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. Decesions 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 lll : Solution ol Equations : Bisection, Secant, Regula Falsi, Newton's Method, Roots of Polynomials : Interpolation: Lagarange and Hermite Interpolation, Divided Differences, Difference Schemes, Interpolation Formula using Differences. Numerical Differentialion. Numerical Ouadrature : 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, Lanezos'Method.

UNIT V: Ordinary Differential Eqution s : 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

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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 flind 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. lt 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 statlements.
7. Write a program jn 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. Wrile 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 ol all sludents in the class using Structure.
14. Write a program in C to calculate the simple interest.
15. Wrile a program in C to sort an array of integers using a function.

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B.Sc. MATHEMATICS

SEMESTER :VI

PAPER (DSE)(iii) MATHEMATICAL MODELLING

Max. Marks: 80;Min.Marks:28 **Hours 45;Credit-3**

UNtT-l Setting up first-order dilferential equations - Oualilative solution sketching. Difference and differential equalion growth models.

UNlTll Single-species population models. Population growth-An age structure model. The spread ol Technological innovalion.

UNIT-lll Higher-order linear models- A model for the detection ot diabetes. Combat modes. Trallic models - Car{following models Equilibrium speed disiributions.

UNIT-lV Nonlinear population growth models. Prey-Predalor models. Epidemic growth models. Models from political science - Proportional represenlation-cumulative voting, compafison voting.

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

REFERENCES:

1. Differential equation models, Eds. Madin Braun, C S Coleman, DA. Drew-
2. Political and Related N,4odels, Steven. J. Brams, WF Lucas, PD Slraflin (Eds)
3. Discrele and Syslem models, W.F. Lucas, F.S. Roberts, R.N4 Thrall,
4. Lile Science Models. H.M. Roberls & M. Thompson.
All volumes published as models in applied Mathematics, Springer-Verlag, 1982.
5. Mathematical Modelling by J.N. Kapur, New Age Inlernational, New Delhi.

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