गोविन्द गुरु जनजातीय विश्वविद्यालय बाँसवाड़ा

चयन आधारित क्रेडिट व्यवस्था की पाठ्यचर्या के अंतर्गत अधिस्नातक पाठ्यक्रम

(Choice Based Credit System)

विषय नाम : MATHS

प्रश्न पत्र सूची

प्रथम सेमेस्टर

क्रम	पेपर कोड	प्रकार	प्रश्न पत्र निर्धारण	पेपर नाम	क्रेडिट
1		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	Advanced Abstract Algebra	4
2		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	**Real Analysis**	4
3		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	**Differential Equations**	4
4		विषय विशिष्ट ऐच्छिक कोर्स (DSE)	1	**Numerical Analysis**	4
5		सामान्य ऐच्छिक कोर्स (GE)	1	**Advanced Calculus**	4
			Total		20

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द्वितीय सेमेस्टर

क्रम	पेपर कोड	प्रकार	प्रश्न पत्र निर्धारण	पेपर नाम	क्रेडिट
1		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	DISCRETE MATHEMATICS	4
2		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	COMPLEX ANALYSIS	4
3		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1	FUNCTIONAL ANALYSIS	4
4		विषय विशिष्ट ऐच्छिक कोर्स (DSE)	1	MATHEMATICAL METHODS	4
5		सामान्य ऐच्छिक कोर्स (GE)	1	INTEGRAL TRANSFORM	4
			Total		20

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तृतीय सेमेस्टर

क्रम	पेपर कोड	प्रकार	प्रश्न पत्र निर्धारण	पेपर नाम	क्रेडिट
1		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1		4
2		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1		4
3		विषय विशिष्ट ऐच्छिक कोर्स (DSE)	1		4
4		सामान्य ऐच्छिक कोर्स (GE)	1		4
5		On-Job Experience (OJT) course or Community Engagement Experience (CEE)	1		4
			Total		20

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चतुर्थ सेमेस्टर

क्रम	पेपर कोड	प्रकार	प्रश्न पत्र निर्धारण	पेपर नाम	क्रेडिट
1		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1		4
2		विषय केन्द्रित अनिवार्य कोर्स (DCC)	1		4
3		विषय विशिष्ट ऐच्छिक कोर्स (DSE)	1		4
4		सामान्य ऐच्छिक कोर्स (GE)	1		4
5		Dissertation/Project/Field Study (DPR) course, Internship or On-Job Experience (OJT) Or Course Seminar (SEM), Research Credit Courses (RCC).	1		4
				Total	20

Abbreviations

- *DCC:Discipline* Centric Compulsory
- DSE: Discipline-Specific Elective
- GE:Generic Elective
- OJT:On Job Training
- CEE:Community Enhancement Experience
- RCC:Research Centric Course
- DPR: Dissertation/Project/Field Report
- SEM:Course Seminar

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Semester I

MATHS

DCC

Advanced Abstract Algebra

UNIT-I

- External and Internal direct product of two and finite number of subgroups; Commutator subgroup; Cauchy's theorem for finite abelian and non abelian groups, sylow's three theorem and their easy applications, Subnormal and Composition series, Zassenhaus lemma and Jordan Holder theorem.

UNIT-II

- Solvable groups and their properties, Nilpotent groups, Fundamental theorem for finite abelian groups, Annihilators of subspace and its dimension in finite dimensional vector space, Invariant, Projection, adjoins, Singular and nonsingular linear transformation.

UNIT –III

- Prime fields of characteristic zero and of prime number, Polynomial rings, Factorization theory in Integral domain, Prime and irreducible elements, Greatest common divisor and least common multiple, Euclidean domain, Principle ideal domain and Unique Factorization domain and their related theorems, Product of ideals and nilpotent ideals, Definition of field and some examples, field extension, introduction to Galois theory.

References:

1. Surjeet Singh and Quazi Zameeruddin : Modern Algebra
2. I.N.Herstein : Topics in algebra
3. R.S.Agrawal : Algebra
4. N. Jacobson : Basic Algebra Vol. I, II
5. S. Lang : Algebra IIIrd Edition
6. P.B. Bhattacharya, S.K. Jain and Etc.: Basic Abstract Algebra (IInd Edition)

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Semester I

MATHS

DCC

Real Analysis

Unit-1:

Function of single variables, limits, continuity and uniform continuity, monotonic function, functions of bounded variation, differentiability, Darboux's theorem, Rolle's theorem, Lagrange's mean value theorem, Cauchy mean value theorem.

Unit-2:

(i) Uniform convergence of sequences and series of functions, various tests including Mn-test and Weirstrass M-test, relations of uniform convergence with the continuity of the limit and the sum functions and also with term by term differentiation and term by term integration.

(ii) Fourier series representation of periodic functions which are even, odd and none of these in the full interval or half the interval

UNIT - III

(i) Convergence of improper integrals - various tests and their applications, Evaluation of such integrals.

(ii) Equivalent sets and their examples, nature of the relations of equivalence. Denumerable and non numerable sets, countable and uncountable sets, Nature of subsets of a countable set and that of a denumerable (countable) sets, union of denumerable (countable) sets, Denumerability of the sets of integers and rational numbers and non denumerability of the closed unit interval [0, 1] and the sets of real numbers and irrational numbers.

References:

1. A. H. Smith, W. A. Albrecht, Fundamental Concepts of Analysis, Prentice Hall of India,1966.

2. N. P. Bali, Real Analysis: Golden Math Series (2011)

3. T. M. Apostol, Mathematical Analysis. Pearson; 2nd edition, 1974.

4. R.R Goldberg, Methods of Real analysis, Oxford & Ibh, 2012.

5. Gokhroo & others : Real Analysis.

6. W. Rudin, Principles of Mathematical Analysis" McGraw-Hill Book Company

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MATHS

DCC

Differential Equations

UNIT – I

Partial differential equation: Existence and uniqueness of solutions, second order partial differential equations, boundary value problems, Green function and Cauchy problem.

UNIT – II

Calculus of variations: Linear functionals, Minimal functional theorem, General variation of a function, Euler – Lagrange's equation, Variational methods of boundary value problems in ordinary and partial differential equations. Variation problems in parametric forms.

UNIT –III

(i) Series solutions of a second order liner differential equations near a singular, point (for benius method). Hyper geometric functions: Definitions of hyper geometric series and function; elementary properties of hyper geometric function; Integral formula for hyper geometric series, Linear transformations, contegeneous function relation, Linear relation between the solutions of hyper geometric differential equation Kumar's confluent hyper geometric function and its simple and basic properties.

(ii) Legendre's differential equation and associated Legendre's differential equations, Simple properties of Legendre's functions of first and second kind.

References:

1. Rainville, E.D. : Special Functions.
2. Sneddon, I.N. : Special Functions.
3. Sneddon, I.N. : Element of Practical differential equation.
4. Forsyth, A.R. : A Treatise of Differential equations
5. Gupta, A.S. : Calculus of variations with Applications
6. Bansal, J.L. : Differential equations Vol. II

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Semester I

MATHS

DSE / GE

Numerical Analysis

UNIT – I

Solution of polynomial equations: Polynomial evaluation, real and complex roots, Synthetic division, The Birge – vita, Bairstow and Graeffe's root squaring method. System of Simultaneous equations (Linear): Direct method of determinant, Gauss – Elimination, Gauss- Jordan Cholesky, Partition method of Successive approximation, Conjugate Gradient , Gaurs or Jacobi iteration, Gauss- Seidel and Relaxation methods.

UNIT – II

Eigen value problems: Basic properties of Eigen values and Eigen vector power methods, Method for finding all Eigen pairs of a matrix, Complex Eigen values. Curve fitting and Function Approximations: Linear square error criterion, Linear regression, Polynomial fitting and other curve fittings, Approximation of functions by Taylor series and Chebyshev Polynomials.

UNIT- III

Numerical Solutions of ordinary differential equations: Taylor series method, Euler's and modified Euler's methods, Runge Kutta method up to fourth order, multi step method (Predictor Corrector strategies), Stability Analysis Single and Multi step methods. Difference method for BVP's ordinary Differential equations: Boundary value problems (BVP's), Shooting methods, Finite Difference method.

References:

1. Jain, Iyenger and Jain: Numerical Analysis

2. Jain, M. K.: Numerical solutions of differential equatio

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Semester I

MATHS

DSE / GE

Optimization Techniques

UNIT-I

Dual simplex algorithm, Bounded value algorithm, Parametric linear Programming, sensitivity analysis, changes in the coefficients of the objective function, changes in the components of vector b, variation in the components (aid) of the matrix A. Addition of the new variable, deletion of a variable, Addition of a new constraint. Deletion of constraint.

UNIT-II

Integer programming problem. All integer and mixed integer programming problems, Gamory's cutting plane methods (Fractional cut and ⅄- cut), Branch and bound method; Traveling salesmanλcutting plane methods (Fractional cut and problem.

UNIT-III

(i) Project scheduling through PERT and CPM, cost time, trade off.

(ii) Quadratic forms, convex functions, Global and relative optimum of a function f(x), unconstrained extreme of differentiable functions, method of Lagrange multipliers for constrained extreme with equality constraints.

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Semester I

MATHS

DSE / GE

Advanced Calculus

UNIT-I:

Inverse function theorem, implicit function theorem, maxima and minima of two variables functions, Lagrange method of undetermined multipliers

UNIT-II:

Geometric interpretation of gradient, divergence and curl; parametric representation of curves and surfaces, tangent and normal to surface, line integrals, fundamental theorem of calculus, double integrals, change of variables.

UNIT-III:

Triple integral, applications to surface area and volume, Dirichlet's theorem, Green's theorem, Stoke's theorem, Gauss divergence theorem.

References:

1. M. Spiegel, D. Spellman and S. Lipschutz, Vector Analysis: Schaum's Outline, McGraw Hill Education, 2009. .

2. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill Education, 2017.

3. M. Spivak, Calculus on Manifolds: A Modern Approach To Classical Theorems of Advanced Calculus, Westview Press, 1971.

4. J.R. Munkres, Analysis on Manifolds, Westview Press, 1997.

5. E. Kreyszig, Advanced Engineering Mathematics, Wiley, 2011.

6. H. K. Das, Advanced Engineering Mathematics, S. Chand, 2007.

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Semester I

MATHS

DSE / GE

Topology

UNIT-I:

Topological spaces: open sets, closed sets, Closure of a set, Limit point of a set, Derived set, Boundary of a set. Kuratowaskis theorem, Open bases, Open subbases, second countable space, separable space, Lindel of theorem, continuous functions in topological spaces, continuity in Metric spaces.

UNIT-II:

Compact Topological spaces: Continuity and compactness, compactness and base, Compactness and subbase, Product of compact spaces, Tychonoff theorem compactness, sequentially compactness and Bolzano-Weirstrass Property and their equivalences in Metric spaces. Seperation Axioms: To - space, T1 - space, Hausdroff space, Regular and completely regular and normal spaces separation Axioms and compactness.

UNIT-III

Connectedness: Connectedness and continuity, Product .of connected topological spaces, Components, connectedness in metric spaces. Approximation: Weirstrass approximation theorem, function algebra, C(X, R) and C (X, C) the real Stone-Weirstrass theorem, Complex Stone-Weirstrass theorem.

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MATHS

DCC

Discrete Mathematics

UNIT-I

Graph theory: Definition of (Undirected) graphs, Paths, Circuits, Cycles and Sub graphs. Indeed subgroups. Degree of vertex. Connectivity. Planner graphs and their properties. Trees. Euler's formula for connected planar graphs complete and complete Bipartite graphs. Spanning trees. Cut sets, Fundamental cut–sets, and Cycles. Minimal spanning trees and kruskal's Algerian. Euler's theorem on the existence of eulerian paths and circuits. Directed graphs. In degree and out degree of a vertex. Weighted undirected graphs, Dijkstra's Algorithm. Strong connectivity and marshal's Algorithm. Directed trees. Surch trees. Tree traversals.

UNIT-II

Introductory computability Theory – Finite state machines and their Transition Table Diagrams. Equivalence of finite state machines. Reduced machines. Homomorphism. Finite Automata. Acceptors. Non- deterministic Finite Automata and equival ends of it are power to that of Deterministic Finite Automata.

UNIT- III

Phrase structure Grammar. Rewriting Rules. Derivations, Sentential forms. Language generated by a Grammar. Regular context – free, and context sensitivity Grammars and Languages. Regular sets, Regular expressions and pumping Lemna Kleene's Theorem stamens.

References:

1. J.L. Gerstling : Mathematical Structures for Computer Science, (3rd edition).
2. N. Arsing Deo : Graph theory with applications to Engineering and Computer Science.
3. K.D. Joshi : Foundation of Discrete Mathematics
4. S. Wiitala : Discrete mathematics – A Unified Approach
5. C. L. Liu : Elements of Discrete Mathematics.

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MATHS

DCC

Complex Analysis

UNIT-1:

COMPLEX ANALYSIS : Complex numbers : The extended plane and its spherical representation, Analytical functions, Cauchy-Riemann equations, Power series including differentiation and integration within the circle of convergence, Conformal transformation, Linear, Bilinear, Exponential, Trigonometric and Joukowski's transformations. Riemann definition of integration, index of a point with respect to a closed curve and general form of Cauchy's integral formula.

UNIT-II Simple connectivity, Cauchy's fundamental theorem, Cauchy's integral formula, Liouville's theorem; Morera's theorem, Taylor's theorem, Laurent's theorem; Poisson's integral formula, Maximum Modulus theorem,

UNIT – III

Convergence of sequence and series, Taylor's series, Laurent series, isolated singular points, Singularities, residues, Cauchy's theorem of residues, Evaluation of improper integrals, Jorden's lemma, argument principle, Rouches theorem, Schwarz's Lemma, Schwarz reflection principle.

References:

1. George F-Simmons: Introduction to Topology and Modem Analysis, McGraw Hill Book Co.
2. S.I. Hu: Elements of Real Analysis
3. H. L. Royden: Real Analysis.
4. G. N. Purohit: Lebesgue Measure and Integration.
5. E.G. Phillips: Functions of a complex variable.

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Semester II

MATHS

DCC

Functional Analysis

UNIT-1:

Metric completion, Baire category theorem, contraction mapping, Banach's fixed point theorem, normed linear spaces, inequalities, Banach Spaces, summability in Banach spaces.

UNIT-2:

Linear operators, operator norm, continuity and boundedness of an operator, norm of a bounded operator, Banach limit, Linear functional, reflexivity, Hahn-Banach theorems and its applications, Stone Weierstrass theorem. Pointwise bounded sets, totally bounded sets, open mapping and closed graph theorems, uniform boundedness principle, trigonometric polynomial, Fourier series, Carleson-Hunt theorem, convergence and divergence of Fourier series.

Unit-3:

Inner product space, orthonormal sets, Gram-Schmidt orthogonalization, Bessel's inequality, orhtonormal basis, Separable Hilbert spaces, projection and Riesz representation theorem . Adjoint operator, normal, unitary, self adjoint operator, compact operator, eigen values, eigen vectors, Banach algebra.

References:

2. Erwin Kreyszig, Functional analysis with applications, John Wiley & Sons, New York, 1978.

3. M. T. Nair, Functional analysis, PHI Learning Pvt. Ltd., Delhi, 2014.

4. J.B. Conway, A Course in Functional Analysis, Springer-Verlag, New York, 1990.

5. W. Rudin, Functional Analysis, Mc Graw-Hill, New York, 1991.

6. B.V. Limaye, Functional Analysis, John Wiley & Sons, 1981

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MATHS

DSE / GE

Mathematical Methods

UNIT-1:

Initial value problems, Langrange method, application to dynamical problems, variational problems with moving boundaries, discontinuous problems, one-sided variations, solution of boundary value problem by Ritz method.

UNIT-2:

Classification of linear integral equations, conversion of initial and boundary value problems into integral equations, conversion of integral equations into differential equations.

Volterra Integral Equations: solution of Volterra integral equations with the help of successive approximations, Neumann series and resolvent kernel, equations with convolution type kernels, solution of integral equations by transform methods, eigenvalues and eigenfunctions for symmetric kernels.

UNIT-3:

Solution of Fredholm integral equations with separable kernels, eigenvalues and eigenfunctions, fundamentals-iterated kernels, constructing the resolvent kernel with the aid of iterated kernels. Fredholm integral equation with degenerated kernels, solutions of homogeneous Fredholm integral equation with degenerated kernel, solution by the successive approximations, Numann series and resolvent kernel, Hilbert-Schmidt theorem, Green's function approach, Fredholm alternative.

References:

1. I. M. Gelfand, S. V. Fomin, Calculus of Variations, Dover Books, 2000
2. Sneddon, I.N. : The use of Integral Transforms.
3. Lowit, : Linear Integral equations.
4. H. Hochstad, Integral Equations, John Wiley & Sons, 1989.

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Semester II

MATHS

DSE / GE

Geometry

UNIT-I

The Axes of Plane Sections: Circular sections, Axes of central sections of a central conicoid, Axes of any section of a central conicoid, Axes of section of a paraboloid, Circular sections, Umblics.

UNIT-II

Generating Lines, The section of a surface by a tangent plane, Systems of generators of a central hyperboloid, Locus of the points of intersection of perpendicular, generators, The projection of generators, Generators' of the hyperbolic paraboloid. Confocal Conicoids: The three confocals through a point,- Elliptic coordinates, confocal touching a given plane, confocal touching a given line, The parameter of the confocals through a point on a central conicoid, The normals. The self polar tetrahedron, The axes of an enveloping cone, The equation to the conicoid.

UNIT-III

Tensors; Transformation of coordinates, Contravariant and covariant vectors, second order tensors, Higher order tensors. Addition, subtraction and multiplication of tensors, Contraction, Quotient Law, symmetric and skew symmetric tensors: Conjugate symmetric tensors of the second order, Fundamental tensor, Associated tensors, Christoffel symbols, Transformation law of Christoffel symbols, Covariant differentiation of vectors and tensors.

References:

1. L. Robert, J-T.Bell : Coordinate Geometry of the three dimensions.
2. Bansal &Sharma : Differential Geometry.
3. B.Spain : Tensor Calculus.
4. J.L.Bansal : Tensor Analysis

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MATHS

DSE / GE

Fluid Mechanics

UNIT-1:

Kinematics of fluid in motion: real and ideal fluids, Lagrangian and Eulerian description, continuity of the mass flow, circulation, rotation and irrotational flows, boundary surface, streamlines, path lines, steak lines, vorticity, Reynolds transport theorem, general equations of motion inviscid case, Bernoulli's theorem, compressible and incompressible flows, Kelvin's circulation theorem.

UNIT-2:

Stream function, complex potential, sources, sinks and doublets, circle theorem, method of images, theorem of Blasius, stokes stream function, motion of a sphere.

UNIT-3:

Stress and strain and relation between stress and strain, Stokes hypothesis, derivation of the Navier-Stokes equations, special forms of Navier Stokes equations, Stokes equations and Euler equations, classification of partial differential equations and physical Behaviour, fully developed flows with examples.

References:

1. G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, 2000

2. H. Schlichting, Boundary Layer Theory, McGraw Hill Education, 2014

3. K. Muralidhar, G. Biswas, Advanced Engineering Fluid Mechanics, Narosa Publishing House, 2006

4. R. K. Rathy, An Introduction to Fluid Dynamics, Oxford and IBH publishing Company, New Delhi, 1976

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MATHS

DSE / GE

Integral Transforms

UNIT-1:

Laplace Transform, existence theorem, shifting theorems, Laplace transform of derivatives and integrals, inverse Laplace transform and their properties, convolution theorem, initial and final value theorem, Laplace transform of periodic functions, error functions, Heaviside unit step function and Dirac delta function, 2nd shifting theorem, applications of Laplace transform to solve IVP.

UNIT-2:

Trigonometric Fourier series and its convergence, Fourier series of even and odd functions, Gibbs phenomenon, Fourier half-range series, Parseval's identity, complex form of Fourier series, Fourier integrals, Fourier sine and cosine integrals, complex form of Fourier integral representation, Fourier transform, Fourier transform of derivatives and integrals, Fourier sine and cosine transforms and their properties, convolution theorem, application of Fourier transforms to boundary value problems.

UNIT-3:

Z-Transforms: Z–transform and inverse Z-transform of elementary functions, shifting theorems, convolution theorem, initial and final value theorem, application of Z-transforms to solve difference equations.

References:

1. E. Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, 1989.
2. R. K. Jain, S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd; 3rd Revised edition, 2007.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd edition, 2014.
4. Ranville, E.D. : Laplace and Fourier Transforms.
5. Sneddon, I.N. : The use of Integral Transforms.
6. Ze manian, A.H. : Generalized Integral transforms

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