DEPARTMENT OF MATHEMATICS

BIRPARA COLLEGE

LESSON PLANNING

PROPOSED UG SYLLABUS IN MATHEMATICS PROGRAMME COURSE UNDER CBCS SYSTEM TO BE INTRODUCED IN 2018

MATHEMATICS(DSC)

SEMESTER-I

PAPER CODE-MATP11DSC

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

CALCULUS AND GEOMETRY

TOPIC	NUMBER OF LECTURES
Unit 1 : Calculus Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to the problems of the type $e^{ax+b}\sin x$, $e^{ax+b}\cos x$, $(ax+b)^n\sin x$, $(ax+b)^n\cos x$, concavity and inflection points, envelopes, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital's rule.	20
Unit 2 Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int \tan^n x\, dx$, $\int \sec^n x\, dx$, $\int (\log x)^n dx$, $\int \sin^n x \sin^m x\, dx$, parametric equations, parameterizing a curve arc length of a curve, arc length of parametric curves, area under a curve, area and volume of revolution.	20
Unit 3 : Properties of conics, rotation of axes and second degree equations, classification of conics using the discriminant, polar equations of conics. Spheres. Cylindrical surfaces. Central conicoids, paraboloids, plane sections of conicoids, generating lines, classification of quadrics.	20

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MATHEMATICS(DSC)

SEMESTER-II

PAPER CODE: MATP24 DSC

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

ALGEBRA

TOPIC	NUMBER OF LECTURES ALLOTTED
Unit 1 Complex numbers: Polar representation, De Moivre's theorem for rational indices and its applications. Trigonometric, logarithm, exponential and hyperbolic functions of complex variable. Theory of equations: Fundamental theorem of Classical Algebra (statement only), relation between roots and coefficients, symmetric functions of roots, transformation of equation, Descartes' rule of signs, Sturms' theorem, cubic equation (Cardan's method), biquadratic equation (Ferrari's method), graphical representation of a polynomial. Inequality: $AM \geq GM \geq HM$, theorem of weighted means and m-th power theorem (statement only), Cauchy-Schwartz inequality (statements only) and its application.	15
Unit 2 Equivalence relations, partition, partially ordered relation, functions, composition of functions, permutations, even and odd permutations, invertible functions. Well-ordering property of positive integers, principles of mathematical induction, division algorithm, divisibility and Euclidean algorithm, congruence relation between integers, Fundamental Theorem of Arithmetic (statement only), solution of linear congruence equations.	15
Unit 3 Matrices: Inverse of a matrix, characterizations of invertible matrices,	15

elementary operations and matrices, echelon matrix, row/column reduced echelon matrix, rank of matrix, normal forms, equivalency and congruency of matrices. Eigen values and eigen vectors of a square matrix, characteristic equation of a matrix, Cayley-Hamilton theorem and its use in finding the inverse of a matrix.	
Unit 4 Systems of linear equations: Consistency, the matrix equation $AX=B$ of a system of linear equations, solution sets of linear systems, solution of linear systems using row reduced form.	15

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MATHEMATICS(DSC)

SEMESTER-III

PAPER CODE-MATP31DSC

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

REAL ANALYSIS

TOPIC	NUMBER OF LECTURES
Unit 1 Review of Algebraic and order properties of $\mathbb{R}$, ε-neighborhood of a point in $\mathbb{R}$. Idea of countable sets, uncountable sets and uncountability of $\mathbb{R}$. Bounded above sets, bounded below sets, bounded sets, unbounded sets. Suprema and infima. Completeness property of $\mathbb{R}$ and its equivalent properties. Archimedean property, density of rational (and irrational) numbers in $\mathbb{R}$, intervals. Limit points of a set, isolated points, open set, closed set, derived set, illustrations of Bolzano-Weierstrass theorem for sets, compact sets in $\mathbb{R}$, Heine-Boreal Theorem.	30
Unit 2 Sequences: Sequence, bounded sequence, convergent sequence, limit of a sequence, lim inf, lim sup. Limit theorems. Monotone sequences, monotone convergence theorem. Subsequences, divergence criteria. Monotone subsequence theorem (statement only), Bolzano Weierstrass theorem for sequences. Cauchy sequence, Cauchy's convergence criterion.	15
Unit 3 Series: Infinite series, convergence and divergence of infinite series, Cauchy criterion. Tests for convergence: Comparison test, limit comparison test, ratio test, Cauchy's nth root test, integral test. Alternating series, Leibniz test. Absolute and conditional convergence	15

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MATHEMATICS(DSC)

SEMESTER-IV

PAPER CODE- MATP41 DSC

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

DIFFERENTIAL EQUATION AND VECTOR CALCULUS

TOPIC	NUMBER OF LECTURES ALLOTTED
Unit 1 : Differential Equation Differential equations and mathematical models. General, particular, explicit, implicit and singular solutions of a differential equation. Exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equation and Bernoulli equations, special integrating factors and transformations. General solution of homogeneous equation of second order, principle of super position for homogeneous equation, Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, method of undetermined coefficients, method of variation of parameters.	20
Unit 2 Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients. Basic theory of linear systems in normal form, homogeneous linear systems with constant coefficients: Two Equations in two unknown functions.	15
Unit 3 Power series solution of a differential equation about an ordinary point, solution about a regular singular point.	10
Unit 4 : Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions.	15

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MATHEMATICS(DSC)

SEMESTER-V

PAPER CODE- MATP52DSE

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

GROUP THEORY AND LINEAR ALGEBRA

TOPIC	NUMBER OF LECTURES ALLOTTED
Unit 1 Symmetries of a square, dihedral groups, definition and examples of groups including permutation groups and quaternion groups (through matrices), elementary properties of groups.	15
Unit 2 Subgroups and examples of subgroups, centralizer, normalizer, center of a group, product of two subgroups.	10
Unit 3 Properties of cyclic groups, classification of subgroups of cyclic groups. Cycle notation for permutations, properties of permutations, even and odd permutations, alternating group, properties of cosets, Lagrange's theorem and consequences including Fermat's Little theorem.	10
Unit 4 : Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.	15
Unit Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphisms.	10

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MATHEMATICS(DSC)

SEMESTER-VI

PAPER CODE- MATP62DSE

TOTAL MARKS: 60(TH)+10(CE)+05(ATT)=75

TOTAL NUMBERS OF LECTURES ALLOTTED-60

LINEAR PROGRAMMING

TOPIC	NUMBER OF LECTURES ALLOTTED
Unit 1 Introduction to linear programming problem. Theory of simplex method, graphical solution, convex sets, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method. Big-M method and their comparison..	15
Unit 2 Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual. Transportation problem and its mathematical formulation, northwest-corner method, least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.	30
Unit 3 Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure, linear programming solution of games.	15