## **DEPARTMENT OF MATHEMATICS**

## BIRPARA COLLEGE

## LESSON PLANNING

## FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

## THE NEW CURRICULAM FRAMEWORK, 2022

## MATHEMATICS(MIN)

## SEMESTER-III

## PAPER CODE- UMATMIN20002

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

## TOTAL NUMBERS OF LECTURES ALLOTTED-60

# CALCULUS, GEOMETRY AND GROUP THEORY

ТОРІС	NUMBER OF LECTURES ALLOTTED
Unit 1: Reduction formulae, derivations and illustrations of reduction formulae of the type $\int sinnx dx$ , $\int cosnx dx$ , $\int secnx dx$ , $\int tannx dx$ , $\int (logx)n dx$ , $\int sinnx cosmx dx$ etc. Successive derivatives, Leibnitz rule and its applications. Indeterminate forms, L'Hospital's rule and it's applications.	10
Unit 2: Volume and surface areas of solids formed by revolution of known plane curves and areas (simple problems only). Concept of parameterizations of a curve. Envelopes, asymptotes, radius of curvature. Concavity, convexity, and inflection points.	13
Unit 3: 2D: Rotation of axes and second-degree equations, pair of straight lines, classification of conics using the discriminant, polar equations of conics.	13
Unit 4: 3D: Spheres, cylindrical surfaces, cones, ellipsoids, paraboloids, hyperboloids, classification of quadrics.	13
<ul> <li>Unit 5: 11 Equivalence relations, functions, permutations, even and odd permutations.</li> <li>Definitions and examples of Groups, finite and infinite groups, commutative groups.</li> <li>Elementary properties of groups. Some well-known groups: Zn, Un, Mn(R), Klein's 4-</li> </ul>	11

group, multiplicative group of <i>n</i> -th roots of	
unity, symmetric group $Sn$ etc. Definition and	
examples of subgroup. Statement of necessary	
and sufficient condition for a subset of a group	
to be a subgroup and its simple applications.	

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#### LESSON PLANNING

#### FOUR YEAR UNDERGRADUATE PROGRAMME IN MATHEMATICS

#### THE NEW CURRICULAM FRAMEWORK, 2022

#### MATHEMATICS(MINOR)

#### SEMESTER-I

#### PAPER CODE-UMATMIN10001

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

#### TOTAL NUMBERS OF LECTURES ALLOTTED-60

#### Topic Number of Lectures Allotted Complex numbers: Polar representation, De Moivre's 10 theorem for rational indices and its applications. Trigonometric, logarithm, exponential and hyperbolic functions of complex variable. Theory of equations: Fundamental theorem of Classical 15 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), biguadratic equation (Ferrari's method). Inequality: $AM \ge GM \ge HM$ , theorem of weighted means 5 and m-th power theorem (statement only), Cauchy-Schwartz inequality (statements only) and its application. Matrices: Inverse of a matrix, characterizations of invertible 15 matrices, elementary operations and matrices, echelon matrix, row/column reduced echelon matrix, rank of matrix, normal forms, equivalency and congruency of matrices. Systems of linear equations: Consistency in equivalence 10 system, Solution of homogeneous system AX=0, Solution of nonhomogeneous system AX=B using row reduced echelon form. Eigen values and eigen vectors of a square matrix, 5 characteristic equation of a matrix, Cayley-Hamilton theorem, and its use in finding the inverse of a matrix.

#### CLASSICAL AND LINEAR ALGEBRA