

## Academic Calendar Department of Mathematics (23-24)

Department of Mathematics								
Subject: MTMG								
Month: August 2022-January 2022					Session-2023-2024			
Sl No	Hons/Gen	Paper	Group	Topic	No. of Lecture	Name of the Lecture		No. Class Taken
1.	Gen	1 <sup>st</sup> Sem		Algebra				
				<b>Classical Algebra</b>	1	Concept of Complex numbers		
					3	Demoivre's Theorem and its Application		
					2	Trigonometric, Exponential and Logarithmic functions and Inverse circular functions		
					3	Relation between roots and coefficients		
					2	Transformation of equations		
					2	Reciprocal and binomial equations and their properties.		



					2	Abelian, non-abelian, groups, Groups under the addition of integer modulo $n$ , Symmetric group, permutation group, General linear group $GL(n,R)$		
					2	Subgroups		
					2	Cyclic Groups		
					1	Cosets		
					1	Lagrange's Theorem and applications		
					1	Order of an element		
					2	Normal Subgroup and its characterisation		
					2	Concepts of Ring and its example		
					2	Division Ring, Integral Domains, Skew-fields		
					2	Concept of Field and Sub-fields and properties		
				<b>Linear Algebra</b>	1	Concept of matrices and its algebraic properties		
					2	Hermitian , Skew-Hermitian, Orthogonal matrices and their properties		
					2	Determinants and its properties		



Subject: MDC Mathematics								
Month: August 2022-January 2022					Session-2023-2024			
	Hons	Sem 2		<b>Basic Mathematics</b>				
				Sets, Relation and Mapping	2	Concepts of sets , operations		
					2	Relations		
					2	Functions and its properties		
				Probability and Statistics	1	Concept of Events and probability		
					4	Random Variables and probability distribution		
					3	Expectation		
					3	Central tendency		
					2	Standard Deviation and Variance		
				Matrix and Determinants	1	Concepts of Matrices		
					1	Types of Matrices		

					2	Elementary row operation and related properties		
					1	Inverse of matrices		
					3	Concept of determinants and its properties		
					2	Solution of a system of equations		
				Co-ordinate Geometry(2D)	3	Distance between two points, Slope, Angle between lines and related properties		
					5	Circles, Parabola, Ellipse, Hyperbola and related problems		
				Linear Programming Problem	1	Concept of LPP		
					2	Graphical Solutions of LPP		
					2	Formation of LPP		
					4	Feasible solution and Optimal Solutions		
2.	Gen	Sem 3		Real Analysis				
					3	Finite and infinite sets, Intervals, examples of countable and uncountable sets.		

					5	Real line, bounded sets, suprema and infima, completeness property of $\mathbb{R}$ ,		
					2	Archimedean property of $\mathbb{R}$		
					4	Concept of cluster points and statement of Bolzano-Weierstrass theorem		
					1	Class Test		
					2	Real Sequence		
					1	Bounded sequence		
					2	Cauchy convergence criterion for sequences		
					4	Cauchy's theorem on limits		
					3	order preservation and squeeze theorem		
					3	monotone sequences and their convergence (monotone convergence theorem without proof).		

					1	Class test		
					4	Infinite series		
					2	Cauchy convergence criterion for series		
					2	positive term series, geometric series		
					3	comparison test,		
					2	convergence of p-series		
					2	Root test		
					2	Ratio test		
					4	alternating series, Leibnitz's test(Tests of Convergence without proof).		
					5	Definition and examples of absolute and conditional convergence.		
					1	Class test		

					3	Sequences and series of functions		
					5	Pointwise and uniform convergence		
					3	Mn-test		
					3	M-test		
					8	Statements of the results about uniform convergence and integrability and differentiability of functions		
					8	Power series and radius of convergence.		
					1	Class Test		
3.	Gen	Sem 5		Matrices				
					5	$\mathbb{R}$ , $\mathbb{R}^2$ , $\mathbb{R}^3$ as vector spaces over $\mathbb{R}$		

					5	Basis and Dimension		
					5	Concept of Linear Independence and examples of different bases		
					5	Subspaces of $R^2$ , $R^3$		
					1	Class test		
					5	Translation, Dilation, Rotation, Reflection in a point, line and plane		
					4	Matrix form of basic geometric transformations.		
					5	Interpretation of eigen values and eigen vectors		
					4	Eigen spaces		
					1	Class Test		
					4	Types of matrices		
					5	Rank of a matrix		

					4	Invariance of rank under elementary transformations.		
					4	Reduction to normal form,		
					5	Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four variables		
					1	Class Test		
					1	Matrices in diagonal form		
					5	Reduction to diagonal form upto matrices of order 3		
					5	Computation of matrix inverses using elementary row operations		
					5	Rank of matrix		
					5	Solutions of a system of linear equations using matrices.		
					5	Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.		

					1	Class Test		
	Month: February 2023- June 2023							
4	Gen	Sem 2		Calculus				
				<b>Limit, Continuity and Differentiation</b>	5	Concept of Limit		
					2	Problems-Solutions		
					1	Class test		
					6	Continuity and discontinuity		
					3	Problems- Solutions		
					1	Class test		
					5	Concept of Limit		

					2	Problems-Solutions		
					1	Class test		
					6	Continuity and discontinuity		
					3	Problems- Solutions		
					1	Class test		
					5	Concept of Limit		
					2	Problems-Solutions		
					1	Class test		
					6	Continuity and discontinuity		
					3	Problems- Solutions		
					1	Class test		

					6	Differentiation		
					2	Problems-Solutions		
					1	Successive Differentiation		
					2	Leibnitz Theorem and its application		
					1	Problem Solutions		
					4	Partial Differentiations		
					2	Euler's Theorem		
					4	Problem Solutions		
					1	Class test		
				Application	2	Tangents and Normals		
					2	Problems-Solutions		

					1	Curvatures		
					2	Problems-Solutions		
					2	Asymptotes		
					2	Problems-Solutions		
					1	Singular Points		
					2	Problems-Solutions		
					5	Tracing of curves		
					3	problem solution on Tracing of curves		
					1	Class Test		
				<b>Mean Value Theorem</b>	1	Role's Theorem		
					1	Problems-Solutions		

					5	Mean Value Theorem		
					3	Problems-Solutions		
					2	Taylor's Theorem		
					1	Maclaurin's Theorem		
					3	Maclaurin's Series		
					2	Problems-Solutions		
					4	Maximum and Minimum		
					2	Problems-Solutions		
5	Gen	Sem 4		Group Theory				

					8	Equivalence relations and partitions, Functions		
					1	Composition of functions		
					1	Invertible functions		
					5	One to one correspondence and cardinality of a set		
					5	Definition and examples of groups, examples of abelian and nonabelian groups, the group $Z_n$ of integers under addition modulo $n$ and the group $U(n)$ of units under multiplication modulo $n$ .		
					3	the general linear group $GL_n(\mathbb{R})$ , groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group $Sym(n)$ , Group of quaternions.		
					6	Cyclic groups from number systems, complex roots of unity, circle group		
					1	Class Test		
					8	Subgroups		

					3	cyclic subgroups		
					3	the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group.		
					5	Cosets, Index of subgroup, Lagrange's theorem		
					2	order of an element		
					6	Normal subgroups: their definition, examples, and characterizations		
					3	Quotient groups		
					1	Class Test		
					12	Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, $Z_n$ the ring of integers modulo $n$ , ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions		
					5	Subrings and ideals		

					12	Integral domains and fields, examples of fields: $Z_p$ , $Q$ , $R$ , and $C$ . Field of rational functions.		
					1	Class Test		

Sl No	Hons/Gen	Paper	Group	Topic	No. of Lecture	Name of the Lecture	Class Taken
1.	Gen	6 <sup>th</sup> Sem		Linear Programming			
				<b>Linear Programming Problem and Graphical Solution</b>	2	Concept of LPP and Historical Background	2
					2	Standard form of LPP and Matrix Representation	2
					2	Formation of LPP	4
					3	Problem Solution on LPP formation	2
					5	Graphical approach of solving LPP: Bounded and Unbounded problems	4
					1	Class Test	1

				<b>Vector and Convex Set</b>	2	Concept of vectors	2
					2	Concept of points, line and planes in n-dimensional euclidean space	2
					2	Hyperplane	2
					2	Linear Combination of vectors	2
					2	Linear dependence and independence of vectors	2
					2	Basis of a vector space	2
					5	Convex combination and Convex sets	4
					3	Convex Polyhedron and Convex hull	3
					2	Separating Hyperplane and Supporting hyperplane	3
					2	Extreme Points	3
					1	Class Test	
					<b>Simplex Method of solution</b>	3	General Linear Programming Problem: Objective function, Constraints and Non-negativity condition.
				2		concept of slack and surplus variables	2

					2	Feasible solution, Basic solution, Degenerate solution, Basic feasible solution.	4
					3	Characteristics of solutions on an LPP	3
					3	Reduction of a feasible solution to a basic feasible solution.	3
					2	Optimal solution and unbounded solution	2
					5	Simplex Algorithm and solution by general simplex method	4
					4	Concept of artificial variable and solution of LPP by Big M method.	4
					5	Solution of LPP by Two Phase Method.	5
					1	Class test	
				<b>Duality Theory</b>	3	Concept of Duality	4
					1	Algorithm of Dual problem	1
					5	Conversion of Primal to Dual	5
					3	Primal-Dual relationship	3
					2	Economical interpretation of Dual	1
					5	Dual Simplex method	7
					1	Class Test	

