

Department	Mathematics	
Paper	CC-1	
Title	Calculus & Analytical Geometry (2D)	
Code	BMTMCCHT101	
No. Lectures	81	
Name of Teacher	GCG, CM, PR, KLD	
Unit	Topic	No. of Lectures
Unit-I :Differential Calculus	Higher order derivatives	1
	Leibnitz rule of successive differentiation and its applications.	4
	Indeterminate forms	2
	L'Hospital's rule	1
	Basic ideas of Partial derivative	1
	Chain Rules	1
	Jacobian	1
	Euler's theorem and its converse.	2
	Tangents and Normals	2
	Sub-tangent and sub-normals	1
	Derivatives of arc lengths	1
	Pedal equation of a curve.	1
	Concavity and inflection points	1
	Curvature and radius of curvature	3
	Envelopes	3
	Asymptotes	4
	Curve tracing in Cartesian and polar coordinates of standard curves.	2
Unit-2: Integral Calculus	Reduction formulae	2
	Derivations and illustrations of reduction formulae	4
	Rectification of plane curves	4
	Quadrature of plane curves	4
	Area of surface of revolution	4
	Volume of surface of revolution.	4
Unit -3: Two-Dimensional Geometry	Transformation of Rectangular axes: Translation	1
	Rotation and Rigid body motion	1
	Theory of Invariants.	1
	Pair of straight lines: Condition that the general equation of second degree in two variables may represent two straight lines	2
	Point of intersection, Angle between pair of lines, Angle bisector	2
	Equation of two lines joining the origin to the points in which a line meets a conic.	4
	General Equation of second degree in two variables: Reduction into canonical form.	4
	Tangents, Normals, chord of contact	3
	Poles and polars	2
	Conjugate points and conjugate lines of Conics.	2
	Polar Co-ordinates, Polar equation of straight lines, Circles, conics	2
	Equations of tangents, normals Chord of contact of Circles and Conics.	4

Department	Mathematics	
Paper	CC-2	
Title	Algebra-I	
Code	BMTMCCHT102	
No. Lectures	83	
Name of Teacher	TKD, CM, DC, GD	
Unit	Topic	No. of Lectures
Unit -1: Classical Algebra	Complex Numbers	2
	De-Moivre's Theorem and its applications	3
	Direct and inverse circular and hyperbolic functions	2
	Exponential, Sine, Cosine and Logarithm of a complex number, Definition of	2
	Gregory's Series	1
	Simple Continued fraction and its convergent	3
	Representation of real numbers	2
	Polynomial equation	2
	Fundamental theorem of Algebra (Statement only), Multiple roots, Statement of Rolle's theorem only and its applications	2
	Equation with real coefficients, Complex roots	1
	Descarte's rule of sign	1
	Relation between roots and coefficients	2
	Transformation of equation	2
	Reciprocal equation	1
	Binomial equation– special roots of unity	2
	Solution of cubic equations–Cardan's method	2
	Solution of biquadratic equation– Ferrari's method	2
	Inequalities involving arithmetic, geometric and harmonic means and their g	6
	Schwarz and Weierstrass's inequalities.	2
Unit -2: Abstract Algebra	Mappings, surjective, injective and bijective	2
	Composition of two mappings	1
	Inversion of mapping	1
	Extension and restriction of a mapping	1
	Equivalence relation and partition of a set	2
	Partially ordered relation.	1
	Hesse's diagram, Lattices as partially ordered set	2
	Definition of lattice in terms of meet and join	2
	Equivalence of two definitions, linear order relation;	2
Unit -3: Number Theory	Principles of Mathematical Induction	2
	Primes and composite numbers	2
	Fundamental theorem of arithmetic	2
	Greatest common divisor	2
	Relatively prime numbers	2
	Euclid's algorithm	1
	Least common multiple	2
	Congruences: properties and algebra of congruences	2
	Power of congruence	2
	Fermat's congruence	2
	Fermat's theorem, Wilson's theorem, Euler – Fermat's theorem	2
	Chinese remainder theorem	2
	Number of divisors of a number and their sum	1
	Least number with given number of divisors	1
	Eulers ϕ function- $\phi(n)$. Mobius μ -function	1
	Relation between ϕ function and μ function.	1
	Diophantine equations of the form $ax + by = c$, a, b, c integers.	2

Department	Mathematics	
Paper	CC-3	
Title	Real Analysis-I	
Code	BMTMCCHT201	
No. Lectures	42	
Name of Teacher	GCG, DC, GD	
Unit	Topic	No. of Lectures
Unit -1: Classical Algebra	Review of Algebraic and Order Properties of $\mathbb{R}$, ε -neighbourhood of a point in $\mathbb{R}$.	2
	Idea of countable sets, uncountable sets and uncountability of $\mathbb{R}$.	3
	Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets.	2
	Suprema and Infima.	2
	Completeness Property of $\mathbb{R}$ and its equivalent properties.	1
	The Archimedean Property, Density of Rational (and Irrational) numbers in $\mathbb{R}$, Intervals.	3
	Limit points of a set, Isolated points, open set, closed set, derived set, Illustrations of Bolzano-Weierstrass theorem for sets.	2
	Sequences, Bounded sequence, Convergent sequence, Limit of a sequence, $\liminf$, $\limsup$.	2
	Limit Theorems.	2
	Monotone Sequences, Monotone Convergence Theorem.	1
	Subsequences, Divergence Criteria.	1
	Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion.	2
	Infinite series, convergence and divergence of infinite series, Cauchy Criterion	2
	Tests for convergence: Comparison test, Limit Comparison test, Ratio Test, Cauchy's nth root test, Raabe's test, Gauss's test (proof not required)	1
	Cauchy's condensation test (proof not required), Integral test.	2
	Alternating series, Leibniz test.	2
	Absolute and Conditional convergence.	2
Unit-2: Graphs	Graphical Demonstration (Teaching Aid)	
	1. Plotting of recursive sequences.	2
	2. Study the convergence of sequences through plotting.	2
	3. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.	2
	4. Study the convergence/divergence of infinite series by plotting their sequences of partial sum.	2
	5. Cauchy's root test by plotting nth roots.	1
	6. Ratio test by plotting the ratio of nth and (n+1)th term.	1

Department	Mathematics	
Paper	CC-4	
Title	Ordinary Differential Equations and Linear Algebra	
Code	BMTMCCHT202	
No. Lectures	60	
Name of Teacher	GCG, DC, GD	
Unit	Topic	No. of Lectures
Unit -1: Differential Equation	Genesis of differential equation: Order, degree and solution of an ordinary differential equation, Formation of ODE	2
	Meaning of the solution of ordinary differential equation, Concept of linear and non-linear differential equations.	3
	Picard's existence and uniqueness theorem (statement only) for $dy/dx=f(x,y)$ with $y = y_0$ at $x = x_0$ and its applications.	2
	Linear Differential Equations, equations reducible to linear forms, Bernoulli's equations.	2
	Solution by the method of variation of parameters.	2
	Differential Equations of first order but not of first degree: Equations solvable for $p = \frac{dy}{dx}$	1
	Equations solvable for y, equation solvable for x, singular solutions	2
	Clairaut's form, equations reducible to Clairaut's Forms- General and Singular solutions.	2
	Applications of first order differential equations: Geometric applications, Orthogonal Trajectories.	1
	Linear differential equation of second and higher order. Linearly dependent and independent solutions, Wronskian	2
	General solution of second order linear differential equation, General and particular solution of linear differential equation of second order with constant coefficients.	2
	Particular integrals for polynomial, sine, cosine, exponential function and for function as combination of them or involving them	2
	Method of variation of parameters for P.I. of linear differential equation of second order	2
	Linear Differential Equations With variable co-efficients: Euler- Cauchy equations	2
	Exact differential equations, Reduction of order of linear differential equation.	2
	Reduction to normal form.	2
	Simultaneous linear ordinary differential equation in two dependent variables.	2
	Solution of simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$	2
	Pfaffian Differential Equation $Pdx + Qdy + Rdz = 0$	1
	Necessary and sufficient condition for existence of integrals of the above (proof not required), Total differential equation.	2
Unit -2: Linear Algebra	Vector space, subspaces, Linear Sum, linear span, linearly dependent and independent vectors Basis, dimensions of a finite dimensional vector space	1
	Replacement Theorem, Extension theorem	2
	Deletion theorem, change of coordinates	2
	Row space and column space, Row rank and column rank of a matrix.	2
	Systems of linear equations, row reduction and echelon forms	2
	Vector equations, the matrix equation $Ax = b$	2
	Existence of solutions of homogeneous system of equations and determination of their solutions	1
	Solution sets of linear systems, applications of linear systems, linear independence.	2

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Unit	Topic	No. of Lectures
Unit -1: Differential Equation	Genesis of differential equation: Order, degree and solution of an ordinary differential equation, Formation of ODE	2
	Meaning of the solution of ordinary differential equation, Concept of linear and non-linear differential equations.	3
	Picard's existence and uniqueness theorem (statement only) for $dy/dx=f(x,y)$ with $y = y_0$ at $x = x_0$ and its applications.	2
	Solution of first order and first degree differential equations: Homogeneous equations and equations reducible to homogeneous forms	2
	Exact differential equations, condition of exactness, Integrating Factor	1
	Rules of finding integrating factor (statement of relevant results only)	3
	Equations reducible to exact forms	2
	Linear Differential Equations, equations reducible to linear forms, Bernoulli's equations.	2
	Solution by the method of variation of parameters.	2
	Differential Equations of first order but not of first degree: Equations solvable for $p = \frac{dy}{dx}$	1
	Equations solvable for y, equation solvable for x, singular solutions	2
	Clairaut's form, equations reducible to Clairaut's Forms- General and Singular solutions.	2
	Applications of first order differential equations: Geometric applications, Orthogonal Trajectories.	1
	Linear differential equation of second and higher order. Linearly dependent and independent solutions, Wronskian	2
	General solution of second order linear differential equation, General and particular solution of linear differential equation of second order with constant coefficients.	2
	Particular integrals for polynomial, sine, cosine, exponential function and for function as combination of them or involving them	2
	Method of variation of parameters for P.I. of linear differential equation of second order	2
	Linear Differential Equations With variable co-efficients: Euler- Cauchy equations	2
	Exact differential equations, Reduction of order of linear differential equation.	2
	Reduction to normal form.	2
	Simultaneous linear ordinary differential equation in two dependent variables.	2
	Solution of simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$	2
	Pfaffian Differential Equation $Pdx + Qdy + Rdz = 0$	1
	Necessary and sufficient condition for existence of integrals of the above (proof not required), Total differential equation.	2