

Teaching Plan, 2024-25 (Even Semester)
Department of Mathematics, Morigaon College

Semester – II (NEP)
Paper: Calculus

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Limits and continuity of a function including different approaches, Properties of continuous functions including Intermediate value theorem.	15	Rajashree Senapati (RS)	20 th Jan, 2025 – 10 th May, 2025	
2	2	(a) Differentiability, Successive differentiation, Leibnitz theorem, Recursion formulae for higher derivatives. (b) Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin x dx$, $\int \cos n x dx$, $\int \tan n x dx$, $\int \sec n x dx$, $\int (\log x)^n dx$, $\int \sin n x \cos m x dx$.	15	Pallab Kumar Borah (PKB)	20 th Jan, 2025 – 10 th May, 2025	
3	3	Rolle's theorem, Lagrange's mean value theorem with geometrical interpretations and simple applications, Maclaurin and Taylor polynomials and their sigma notations. Taylor's formula with remainder, Introduction to Maclaurin and Taylor series.	15	Upashana Gogoi (UG)	20 th Jan, 2025 – 10 th May, 2025	
4	4	Functions of two or more variables, Partial differentiation up to second order, Euler's theorem on homogeneous functions	15	Prafulla Kumar Bora (PB)	20 th Jan, 2025 – 10 th May, 2025	

Paper: Foundations of Mathematical Sciences – II (MDC)

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Mathematical reasoning: Meaning of mathematical statements, Negation, Compound statements, Quantifiers, Converse and Contrapositive of the statement, Implications, Validating statements. Sequence and Series (AP, GP), Logical reasoning: Odd man out and series, Blood relations, Coding Decoding, Logical sequence, Logical matching, Logical thinking, missing numbers, Logic puzzles.	12	PKB	20 th Jan, 2025 – 10 th May, 2025	
2	2	Factorial notations, Permutation & Combination (basic definition and everyday problems), Pigeonhole principle, Mathematical Induction, Binomial theorem (for positive index), Principle of Inclusion and Exclusion, Derangements, Inversion formulae, Inequalities, Solution of inequations, Trigonometry, problems based on height and distances. Mensuration, area, volume, surface area and perimeter	12	RS	20 th Jan, 2025 – 10 th May, 2025	

N.B.: Unit 3 and Unit 4 will be taken by Department of Economics.

Semester-IV (NEP)
Paper I: Real Analysis

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Algebraic and order properties of \mathbb{R} , absolute value and real line, bounded sets, supremum and infimum, completeness property of \mathbb{R} , the Archimedean property, the density theorem, intervals, Nested interval theorem, uncountability of \mathbb{R} .	15	RS	20 th Jan, 2025 – 10 th May, 2025	
2	2	Real sequences, limit of a sequence, convergent sequence, bounded sequence, limit theorems, monotone sequences, monotone convergence theorem, subsequences, monotone subsequence theorem, Bolzano Weierstrass theorem for sequences, Cauchy sequences, Cauchy's convergence criterion, properties of divergence sequences.	20	PKB	20 th Jan, 2025 – 10 th May, 2025	
3	3	Infinite series, convergence and divergence of infinite series, Cauchy criterion, Tests for convergence: comparison test, limit comparison test, ratio test, root test, integral test, Raabes's test, Absolute convergence, rearrangement theorem, alternating series, Leibniz test, conditional (non-absolute) convergence.	25	PB	20 th Jan, 2025 – 10 th May, 2025	

Paper II: Complex Analysis

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Functions of complex variable, mappings, limits, theorems on limits, limits involving point at infinity, continuity. Derivatives, rules for differentiation, Cauchy-Riemann equations, sufficient conditions for differentiability, polar co-ordinates.	10	PKB	20 th Jan, 2025 – 15 th March, 2025	
2	2	Analytic functions, examples of analytic functions, harmonic function. The exponential function, Logarithmic function, examples, branches and derivatives of logarithms, some identities involving logarithms, the power function. trigonometric function, zeros and singularities of trigonometric functions derivatives of functions, definite integrals of functions.	15	PKB	17 th March, 2025 – 10 th May, 2025	
3	3	Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals, antiderivatives, proof of antiderivative theorem.	10	RS	20 th Jan, 2025 – 15 th March, 2025	
4	4	Cauchy-Goursat theorem, simply connected domains, multiply connected domains, Cauchy integral formula, extension of Cauchy integral formula, Liouville's theorem and the fundamental theorem of algebra.	10	RS	17 th March, 2025 – 10 th May, 2025	
5		Practical	30	UG	20 th Jan, 2025 – 10 th May, 2025	

Paper III: Analytical Geometry

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Transformation of coordinates, invariants under orthogonal transformations, pair of straight lines.	15	PB	20 th Jan, 2025 – 15 th Feb, 2025	
2	2	Parabola, parametric coordinates, tangent and normal, ellipse and its conjugate diameters with properties, hyperbola and its asymptotes, General conics: tangent, condition of tangency, pole and polar, centre of a conic, equation of pair of tangents, reduction to standard forms, central conics, equation of the axes, and length of the axes, polar equation of a conic, tangent and normal, and properties.	151	PB	17 th Feb, 2025 – 15 th Mar, 2025	
3	3	Quadric surfaces: Sphere, Cylinder and Cone. Cylindrical and spherical polar coordinates.	15	PB	17 th Mar, 2025 – 19 th Apr, 2025	
4	4	Rectangular coordinates in 3-space, Vector viewed geometrically, Vectors in coordinates system, Vectors determined by length and angle, Dot product, Cross product and their geometrical properties, Triple product, Parametric equations of lines in 2-space and 3-space.	15	PB	21 st Apr, 2025 – 10 th May, 2025	

Paper IV: Number Theory

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Well-Ordering Principle of integers, Archimedian property, First principle of finite induction, Second principle of finite induction, The division algorithm of integers, The greatest common divisor, The Euclidean algorithm, The Diophantine equation, Fundamental Theorem of Arithmetic, The sieve of Eratosthenes, The Goldbach Conjecture.	20	UG	20 th Jan, 2025 – 28 th Feb, 2025	
2	2	Congruence modulo of a fixed positive integer, Basic properties of congruences, Binary and decimal representation of integers, Linear congruences, Chinese Remainder Theorem, Fermat's Little Theorem, pseudoprimes, Wilson's Theorem.	20	UG	1 st Mar, 2025 – 5 th Apr, 2025	
3	3	Number Theoretic Functions: The sum and number of divisors of a positive integer, Multiplicative functions, Möbius function, The Möbius inversion Formula, The greatest integer function, Euler's Phi-Function, Euler's Theorem, Properties of Euler's Phi function.	20	UG	7th Apr, 2025 – 10 th May, 2025	

Semester-VI (CBCS)
Paper: MAT-HC-6016: Riemann Integration and Metric spaces

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Riemann integration: upper and lower sums; Darboux integrability, properties of integral, Fundamental theorem of calculus, mean value theorems for integrals, Riemann sum and Riemann integrability, Riemann integrability of monotone and continuous functions on intervals, sum of infinite series as Riemann integrals, logarithm and exponential functions through Riemann integrals, improper integrals, Gamma functions.	20	Upashana Gogoi	20 th Jan, 2025 – 28 th Feb, 2025	
2	2	Metric spaces: definition and examples, sequences in metric spaces, Cauchy sequences, complete metric spaces. Open and closed balls, neighbourhood, open set, interior of a set. Limit point of a set, closed set, diameter of a set, Cantor's theorem. Subspaces, dense sets, separable spaces.	20	Upashana Gogoi	1 st Mar, 2025 – 5 th Apr, 2025	
3	3	Continuous mappings, sequential criterion and other characterizations of continuity. Uniform continuity. Homeomorphism, Contraction mappings, Banach contraction mapping principle. Connectedness, connected subsets of \mathbf{R} , connectedness and continuous mappings.	20	Upashana Gogoi	7th Apr, 2025 – 10 th May, 2025	

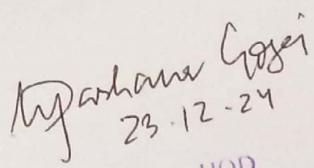
Paper: MAT-HC-6026: Partial Differential Equations

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Introduction, Classification, Construction of first order partial differential equations (PDE). Cauchy's problem for first order equations, linear equations of the first order, Integral surfaces passing through a given curve, Nonlinear partial differential equations of the first order, Cauchy's method of characteristics, Charpit's method. Solutions satisfying given conditions, Jacobi's method.	15	PKB/RS	20 th Jan, 2025 – 28 th Feb, 2025	
2	2	Canonical form of first order PDE, Method of separation of variables for first order PDE.	15	PKB/RS	1 st Mar, 2025 – 5 th Apr, 2025	
3	3	Reduction to canonical forms, Equations with constant coefficients, General solution.	15	PKB/RS	7th Apr, 2025 – 10 th May, 2025	
4		Practical	20	Upashana Gogoi	20 th Jan, 2025 – 10 th May, 2025	

Paper:MAT-HE-6046: Hydromechanics

Sl. No.	Unit	Topic	Total number of lectures	Teacher assigned	Proposed time	Remarks
1	1	Hydrostatics Pressure equation, condition of equilibrium, lines of force, homogeneous and heterogeneous fluids, elastic fluids, surface of equal pressure, fluid at rest under action of gravity, rotating fluids. Fluid pressure on plane surfaces, center of pressure, resultant pressure on curved surfaces. Gas law, mixture of gases, internal energy, adiabatic expansion.	30	Prafulla Kumar Bora	20 th Jan, 2025 – 15 th Mar, 2025	
2	2	Hydrodynamics Real and ideal fluid, velocity of a fluid at a point, Eulerian and Lagrangian method, stream lines and path lines, steady and unsteady flows, velocity potential, rotational and irrotational motions, material local, convective derivatives, local and particle rate of change, equation of continuity, examples, acceleration of a fluid at a point. Equation of motion (For non-viscous fluid)	30	Prafulla Kumar Bora	17 th Mar, 2025 – 10 th May, 2025	

*Project in lieu of DSE-4


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