



গড়গাঁও মহাবিদ্যালয়

GARGAON COLLEGE

TEACHING PLAN

DEPARTMENT OF MATHEMATICS

JULY 2019 - JUNE 2020



গড়গাঁও মহাবিদ্যালয়

GARGAON COLLEGE

GARGAON COLLEGE

TEACHING PLAN

Course: B.A./B. SC.

Session: Odd semester 2019 (July-December)

Subject: MATHEMATICS


Name of the Teacher: Milon Bhuyan

Methods to be applied: Lecture, activity method, interaction, and discussion.

Teaching Materials: White Board, Marker Pen, Duster, Books, Journals, Laptop, Projector

Paper Code/ Title	Allotted Unit	No. of Class Required	Detail of the topics to be taught	No. of tutorials
C1: Calculus	Unit-3	14	Parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution. Techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.	6
C2: Algebra	Unit-2	10	Equivalence relations, Functions, Composition of functions, Invertible functions, One to one correspondence and cardinality of a set, Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, statement of Fundamental Theorem of Arithmetic.	6
MM301: Differential Calculus	Unit-1	5	Successive differentiation, Leibnitz's theorem, Indeterminate forms, Sub tangent, sub normal, derivative of arc length (Cartesian and polar forms), values of , angle between radius vector and tangent ,polar sub tangent and polar subnormal, curvature and radius of curvature.	1
	Unit-2	5	Function of one variable: Functions continuous on closed intervals, Differentiability, Darboux's theorem, Rolle's theorem, Lagrange mean value theorem, Cauchy's mean value theorem, Taylor's theorem, Taylor's series, Maclaurin's series.	2
	Unit-3	2	Partial derivatives, Euler's theorem on homogeneous function.	1

	Unit-4	5	Function of several variable : Explicit and implicit functions, continuity, partial derivatives, definition of Jacobian, partial derivatives of higher order, Young's and Schwarz's theorems(without proof), change of variables, Taylor's theorem, extreme values.	3
NM301: Real Analysis	Unit-1	5	Successive differentiation, Leibnitz's theorem, indeterminate forms, Sub tangent, sub normal, curvature and radius of curvature.	2
	Unit-2	6	Function of one variable: Functions continuous on closed intervals, Differentiability, Darboux's theorem, Rolle's theorem, Lagrange mean value theorem, Cauchy's mean value theorem, Taylor's theorem, Taylor's series, Maclaurin's series.	2
	Unit-3	3	Partial Derivatives, Euler's theorem on homogeneous function.	1
	Unit-4	5	Evaluation of definite integrals by using properties only, Reduction formula of the integrands $\sin n$, $\cos n$, $\tan n$ and $\sin n \cos n$, Rectification of plane curves.	2
MM502: Linear Algebra	Unit-1	10	System of linear equations, Definitions and examples of Vector space, vector subspace, basis and dimension of a Vector Space.	2
	Unit-2	9	Definition of a line, Affine Space, Quotient Space, Linear transformation, Representation of Linear maps by Matrices, Kernel and image of a linear transformation, linear isomorphism, Geometric Ideas and some loose ends.	4
MM502: Number theory	Unit-1	3	Peano's axiom, Well-ordering property of positive integer, Division Algorithm, Theorems, G.C.D., Theorems, Euclidean Algorithm.	1
	Unit-2	3	Prime numbers, unique factorization theorem (fundamental theorem of arithmetic), Euclid's theorem, greatest integer function[n].	1
	Unit-3	9	Definition, Basic properties of congruence, complete residue system, reduced residue system. Fermat's little theorem, Euler's theorem, Wilson's theorem, Solution of Congruence, Solutions of the problems of type $ax+by+c=0$, Chines Remainder theorem, Solutions of simultaneous equations by using Chines Remainder theorem.	2
	Unit-4	5	Arithmetic Function, Euler's function, Division function, Mobius function, the functions $\phi(n)$, $P(n)=\sum_{d n} \phi(d)$, $\sum_{d n} \phi(d)=n$, Mobius inversion formula, Properties of arithmetic functions.	1


 Head
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 Gargaon College

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TEACHING PLAN

Course: B.A./ BSc.

Session: Even semester 2020 (January-June)

Subject: MATHEMATICS

Name of the Teacher: Milon Bhuyan

Methods to be applied: Lecture, activity method, interaction, and discussion.

Teaching Materials: White Board, Marker Pen, Duster, Books, Journals, Laptop, Projector

Paper Code/Title	Allotted Unit/ Topic	No. of Class Required	Detail of the topics to be taught	No. of tutorials
C3: Real Analysis	Unit-1	30	Review of Algebraic and Order Properties of \mathbb{R} , - 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, The Completeness Property of \mathbb{R} , The Archimedean Property, Density of Rational (and Irrational) numbers in \mathbb{R} , Intervals. Limit points of a set, Isolated points, Illustrations of Bolzano-Weierstrass theorem for sets.	5
GE-2: Differential Equation	Unit-5	12	Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.	3
MM402: Multiple Integral	Unit-1	5	Fourier series: Preliminary & other theorems, main theorem, series for even function, odd functions, half range series, Interval	2
	Unit-2	6	Integration over \mathbb{R}^2 : Line integrals , double integrals, double integrals over a region double integrals over a closed domain, Green's theorem.	3
	Unit-3	7	Integration over \mathbb{R}^3 : Surface and surface integral, Stoke's and Gauss's theorems and their applications.	2
MM601: Metric Space	Unit-1	7	Definition and examples of metric spaces, Open spheres and closed spheres, Neighborhoods, Open sets, Equivalent metrics, Interior points, Closed sets, Limit points and isolated points, Closure of a set, Boundary points, Distance between sets and diameter of a set, Subspace of metric space, Product metric spaces (definition only), Bases.	2
	Unit-2	5	Convergent sequences, Cauchy sequences, complete & separable spaces, dense sets.	1
	Unit-3	4	Continuous functions: Definition and characterizations, Extension theorem, Uniform continuity (definition only), Homeomorphism.	2
	Unit-4	3	Compact spaces and compact sets, Sequential compactness	1

MM601: Statistics	Unit-1	5	Probability: Basic terminology, Mathematical probability, Statistical probability, Axiomatic approach to probability. Some theorems on probability, Conditional probability, Multiplication theorem of probability, Independent events, Multiplication theorem of probability for independent events, Extension of multiplication theorem of probability, Baye's theorem.	2
	Unit-2	2	Measures of Dispersion: Standard deviation, Quartile deviation, co-efficient of variation.	1
	Unit-3	3	Correlation and regression: Karl Pearson's co-efficient of correlation, Spearman Rank correlation co-efficient, regression lines and equation.	1
	Unit-4	5	Theoretical Probability Distribution: Binomial, Poisson and Normal Distribution and their applications to simple problems.	2
	Unit-5	3	Time series analysis: Different components of time series, analysis of trends (Least Square Method and Moving Average Method)	1


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TEACHING PLAN

Course: B.A./B. SC.

Session: Odd semester 2019 (July-December)

Subject: MATHEMATICS

Name of the Teacher: Dr. Kabita Phukon

Methods to be applied: Lecture, analytical and activity method, interaction and discussion.

Teaching Materials: White Board, Marker Pen, Duster, Books, Journals, Laptop, Projector

Paper Code/ Title	Allotted Unit	No. of Classes Required	Details of the topics to be taught	No. of Tutorials
C1: Calculus	Unit-1	16	20 Hyperbolic functions, higher order derivatives, Leibniz rule and its applications to problems of type $\sin x$, e , $\cos x$, $(ax + b)$, $n \sin x$, $(ax+b)$, $\cos x$, concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospitals rule, applications of maxima and minima.	4
C2: Algebra	Unit-2	25	Equivalence relations, Functions, Composition of functions, Invertible functions, One to one correspondence and cardinality of a set, Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, statement of Fundamental Theorem of Arithmetic.	5
GE-1: Differential Calculus	Unit-1	25	Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.	5
MM302: Coordinate Geometry 2-D	Unit-1	2	Transformation of coordinates: Translation of axes, Rotation of axes, Invariants, Removal of xy -term.	1
	Unit-2	5	Pair of straight lines: Pair of straight lines through origin, Angle and Bisectors of the angle between the lines given by homogenous equation of 2nd degree, Condition for the general equation of second degree to represent a pair of straight lines, Pair of intersecting straight lines, Pair of parallel straight lines.	1
	Unit-3	5	General Equation of second degree: Equation to the conic sections, Centre of a conic, Reduction to central and non central conic, Tangent to the conic and condition of tangency, Chord of contact, Pole and Polar, conjugate diameter.	2

MM302: Coordinate Geometry 3-D	Unit-1	4	Equation of planes, straight lines.	1
	Unit-2	3	Shortest distance between two lines, Skew lines.	1
MM302: Algebra I	Unit-1	10	Binary Composition, Definition and Examples of Group, Elementary properties and theorem of Group, Subgroups, Lagrange's theorem, cyclic groups.	2
	Unit-2	11	Normal subgroups, Quotient groups, Homomorphisms – Isomorphisms, permutations, cyclic permutations, cycles of a permutation, disjoint permutations, Permutation Group, Cayley's theorem.	2
NM301: Coordinate Geometry 2-D	Unit-1	2	Transformation of coordinates: Translation of axes, Rotation of axes, Invariants, Removal of xy-term.	1
	Unit-2	5	Pair of straight lines: Pair of straight lines through origin, Angle and Bisectors of the angle between the lines given by homogenous equation of 2nd degree, Condition for the general equation of second degree to represent a pair of straight lines, Pair of intersecting straight lines, Pair of parallel straight lines.	1
	Unit-3	5	General Equation of second degree: Equation to the conic sections, Centre of a conic, Reduction to central and non-central conic, Tangent to the conic and condition of tangency, Chord of contact, Pole and Polar, conjugate diameter,	2
MM503: Hydro Dynamics	Unit-1	7	Kinematics: 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, local and particle rate of change, equation of continuity, examples, acceleration of a fluid at a point, General analysis of fluid motion.	2
	Unit-2	5	Equation of Motion: Euler's equation of motion, Bernoulli's equation, steady motion under conservative forces, impulsive motion, circulation, Kelvin's circulation theorem.	2
	Unit-3	4	General theory of irrotational motion: Potential flow, deductions from Green's theorem, kinetic energy of a liquid, uniqueness theorems, Kelvin's minimum energy theorem, Mean value of velocity potential.	1
MM503: Hydro Statics	Unit-1	8	Fluid Pressure: Introduction, Fluid Pressure and related theorems, Density and specific gravity, Theorems on fluid pressure under gravity, Rate of variation of pressure, Differential equation of pressure, Condition of equilibrium, Equi-pressure surfaces and lines of force, Curves of equi-pressure and equi-density, Examples.	3
	Unit-2	9	Resultant Pressure and Centre of Pressure: Resultant fluid pressure and related theorems, Centre of pressure, Determination of centre of pressure of parallelogram, triangle, circle under different conditions, Examples, Thrust on curved surfaces, Examples.	2
	Unit-3	5	Equilibrium and Stability of Floating Bodies: Condition of equilibrium of floating bodies, Examples, Unstable and Neutral equilibrium, Determination of Meta centre, Examples.	2

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C4: Differential Equations	Unit-1	10	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.	5
	Unit-3	20	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.	5
GE-2: Differential Equation	Unit-1	10	First order exact differential equations. Integrating factors, rules to find an integrating factor.	5
	Unit-3	15	Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.	5
MM401: Computer Programming and Lab.	Computer Laboratory (Practical)	10	1. Temperature conversion 2. Area of triangle 3. Solution of linear equations 4 Simple and compound interest 5. Sum of series 6. Solution of quadratic equation 7. Checking of Prime numbers 8. Sum of sine, cosine and Fibonacci series 9. Mean and standard deviation 10. Printing of a matrix 11. Matrix addition, subtraction, multiplication, transpose 12. Solution of equation by Newton – Raphson	4

			method, Bisection method. 13. Simpson's 1/3 rule 14. Sorting of numbers (ascending and descending) 15. Computation of salary 16. Find the largest number among three numbers 17. Finding the factorial of a number 18. Printing of even and odd numbers in a range 19. Sum of digits of a number 20. Printing of numbers in various forms, number tables.	
	Matlab	5	Evaluation of arithmetic expression, exponential, logarithmic and trigonometric functions, computation of complex numbers, Plotting of curves (Algebraic function, trigonometric function and exponential function), Operations in matrices, Plotting of 3D curves and shapes, Solution of algebraic equation, simultaneous linear equations	2
NM401: Linear Programming and Lab.	Practical	16	Matlab / Mathematica: Evaluation of arithmetic expression, exponential and logarithms, trigonometric functions, computation of complex numbers, Plotting of curves (Algebraic function, trigonometric function, and exponential function), Operations in matrices, Plotting of three 3D curves and shapes, Solution of algebraic equation, simultaneous linear equations.	5

MM603: Algebra II	Unit-1	5	Automorphism of groups, Inner automorphism, external and internal direct products.	2
	Unit-2	7	Definition and examples of Ring, Special kinds of rings, sub rings and ideals, sum and product of ideals.	2
	Unit-3	6	Quotient Ring, Homomorphism of ring, Imbedding of rings, Maximal and Prime ideal.	3
MM603: PDE	Unit-1	10	Introduction, Origins of First order PDE, Cauchy Problem for First order equations, Linear equations of first order, Lagrange equation, Integral Surface passing through a given curve, surface orthogonal to a given system of surfaces.	3
	Unit-2	10	Nonlinear PDE of first order, Cauchy Method of characteristics, Compatible systems of first order equation, Charpit's Method, special types of first order equations, solution satisfying given conditions, Jacobi's Method.	2


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TEACHING PLAN

Course: B.A./B. SC.

Session: Odd semester 2019 (July-December)

Subject: MATHEMATICS

Name of the Teacher: Mr. Harekrishna Mili

Methods to be applied: Lecture, analytical and activity method, interaction and discussion.

Teaching Materials: White Board, Marker Pen, Duster, Books, Journals, Laptop, Projector, Smart Tv

Paper Code/ Title	Allotted Unit	No. of Classes Required	Details of the topics to be taught	No. of Tutorials
C1: Calculus	Unit-2	8	Reduction Formulae of the types $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \tan^n x dx$, $\int (\log x)^n dx$ and $\int \sin^n x \cos^n x dx$ and their derivations. Rectification, volume and surface area of revolution of a curve.	4
GE-1: Differential Calculus	Unit-2	10	Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.	6
MM301: Integral Calculus	Unit-2	7	Function of one variable: Functions continuous on closed intervals, Differentiability, Darboux's theorem, Rolle's theorem, Lagrange mean value theorem, Cauchy's mean value theorem, Taylor's theorem, Taylor's series, Maclaurin's series.	3
NM301: Coordinate Geometry	Unit-1	4	Equation of planes, straight lines.	1
	Unit-2	3	Shortest distance between two lines, Skew lines.	1
MM501: Logic	Unit-1	5	The Statement Calculus: Introduction, Sentential Connectives, Truth tables, Truth value, Validity, truth function, tautology and related theorems, arithmetic representation of sentential connectives.	1
	Unit-2	1	Theory of Inference: Consequence, rule of inference and applications. Predicate calculus: symbolizing language.	2

MM501: Combinatorics	Unit-1	4	Fundamental Principles of Counting: Binomial Theorem, Pascal and Vander Monde's identity, Multinomial theorem, Ramsey number, Catalan numbers, Stirling and Bell number.	1
	Unit-2	5	The principles of Inclusion-Exclusion: The principles of Inclusion-Exclusion, Generalization of the principles of Inclusion-Exclusion, Pigeon Hole Principle, Derangement, Generating function and introductory examples,	1
MM501: Complex analysis	Unit-1	5	Analytic Function: Limit, Continuity and differentiability, Analytic functions, Cauchy-Riemann equations. Necessary and sufficient condition for a function to be analytic, polar form of C.R. equation, Harmonic functions, Construction of analytic function.	1
	Unit-2	7	Complex Integrals : Definite integral, Jordan arc, contour, line integrals, Cauchy's theorem, simply and multiply connected domains, Cauchy's integral formula, Derivatives of analytic function, Morera's theorem, Liouville's theorem.	2
	Unit-3	3	Power series: Taylor's series, Laurent's series and their related problems.	1
	Unit-4	6	Poles & Residues: Definition and statement of the related theorems of isolated singularity, removable singularity and poles, calculation of residues, Cauchy's residue theorem.	2


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Paper Code/ Title	Allotted Unit	No. of Class Required	Details of the topics to be taught	No. of Tutorials
C3: Real Analysis	Unit-2	25	Sequences, Bounded sequence, Convergent sequence, Limit of a sequence. 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.	10
C4: Differential Equation	Unit-2	8	Introduction to compartmental model, exponential decay model, lake pollution model (case study of Lake Burley Griffin), drug assimilation into the blood (case of a single cold pill, case of a course of cold pills), exponential growth of population, limited growth of population, limited growth with harvesting.	2
GE-2: Differential Equation	Unit-4	16	Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.	4

MM401: Computer Programming and Lab.	Unit-1	4	Introduction to C-Programming: Basic programming concept, programming approach to solving problem, flowcharts, algorithm, character set, C tokens, keywords and identifiers, constants, variables, data types, declarations of variables, declaration of storage class, assigning values to variables.	2
	Unit-2	4	Operators and expressions: Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, arithmetic expressions, precedence of arithmetic operators, type conversions in expressions operator precedence and associativity, mathematical functions.	1
	Unit-3	3	Input output operations: Reading and writing a character, formatted input and formatted output.	1
	Unit-4	3	Decision Making and Branching, IF statement, IF ... ELSE statement, nested IF, ELSE IF Ladder, WHILE statement, DO statement, FOR statement, Jumps in Loops.	1
	Unit-5	4	Arrays: One dimensional arrays, declaration of one dimensional arrays, initialization of one dimensional arrays, two dimensional arrays, initializing two dimensional arrays, multi-dimensional arrays.	2
	Unit-6	3	User defined functions: Elements of user defined functions, Definition of functions, return values and their types, function calls, function declaration, category of functions, no arguments and no return values, arguments with return values, no arguments but returns a value, functions that return multiple values.	1
NM401: Linear Programming and Lab.	Unit-1	6	LP Model formulation & Graphical Method: Introduction, General structure and assumption of LP model, Mathematical formulation of a linear programming problem, Example of LP model Formulation, Feasible solution, basic solution, graphical method for the solution of a linear programming problem, convex set.	2
	Unit-2	5	Theory of simplex algorithm and simplex method: Standard form of an LP Problem, Simplex Algorithm, Solutions of unique optimal solution, alternative optimal solution, unbounded solution, artificial variable technique (Charnes' M-technique, two phase method), Degeneracy.	3
	Unit-3	4	Duality Theory: Concept of duality, Types of primal dual problem, Standard form, Rules for constructing the dual from primal, Simple and mixed type problems, Theorem on duality, Fundamental duality theorem (Statement only).	1
	Unit-4	6	Transportation Problem: Definition, Transportation Table, Loops in transportation tables and their properties, Determination of an initial basic feasible solution by North West corner method, Matrix minima or least cost method and Vogel approximation method, unbalanced transportation problem, optimization by Modi method.	2

MM602: Discrete Mathematics	Unit-1	4	Recurrence Relations: Formulation as Recurrence Relations, Solutions of Recurrence Relations, Solutions of homogeneous and non homogeneous linear Recurrence Relations, Generating Functions.	3
	Unit-2	5	Lattice: Definition and examples, Hasse diagram, Properties of Lattice, Lattice as an Algebraic systems, Sub lattice and lattice isomorphism, Special Classes : of lattice, Distributive lattice and Boolean algebras.	2
	Unit-3	6	Boolean Algebra: Boolean algebra as lattice and an algebraic system, Properties of Boolean algebra, Sub-algebra and homomorphism of Boolean algebra, Boolean expressions, sum-of-products canonical form, values of Boolean expression & Boolean functions, representation by Karnaugh Maps, minimization of Boolean functions using Karnaugh Maps.	2
	Unit-4	5	Logic Gates, Switching circuits & Logic circuits: Introduction, Gates and Boolean algebra, Applications, Special Sequences, Switching circuits, simplification of circuits, bridge circuits, logic circuits, multiple output logic circuit, minimization	2
MM602: Graph Theory	Unit-1	10	Graph Theory: Definition, Directed and undirected graphs, basic terminologies, finite and infinite graph, incidence and degree of vertex, isolated and pendent vertices, null graph, Handshaking theorem, types of graphs, sub graphs, graphs isomorphism, operations of graphs, connected graph, disconnected graphs and components.	2
	Unit-2	7	Walk, path and circuits, Eulerian graphs, Hamiltonian graphs, Dirac's theorem, Ore's theorem, Konigsberg's Bridge problem, Representation of graphs, matrix representation of graph, adjacency matrix, Incidence matrix, Linked representation of graph	2


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