Month-wise Schedule of B.Sc. (MATHEMATICS) Part I

SESSION 2022-23(SEMESTER-1)

Faculty Title of Paper	September	October	November	December
Dr. Jyotindra Thakur Paper - I Calculus-I	ϵ -δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability, Derivative of nth order. Leibnitz theorem, Asymptotes.	Test for concavity and convexity, Points of Inflexion, Tracing of Curves with y'and y''(Standard curves in Cartesian form without use of Grapher).	Functions of several variables: Limits, continuity and differentjability of two variables. Partial derivatives and its Linearization, Chain rule, Partial deriva[ive with constrained variable.	Homogeneous functions, Euler theorem and its applications, Extreme value and saddle points, Lagrange multipliers, Taylor's theorem and Its linear and quadratic approximation.
Dr. Jyotindra Thakur PAPER - II DIFFERENTIAL EQUATIONS	First order differential equations : Order and degree of a differential equation, Separable differential equations, Homogeneous differential equations, exect differential equations,linear differential equations and equations reducible to linear differential equations.	Higher order differential equations : Wronskian, Solution of Linear homogeneous and non-homogeneous differential equations of higher order with constant coefficients and with variable coefficients, Method of Variation of Parameters.	Higher order differelitial equations : Differential operator method, Linear non-homogeneous differential equations with variable coefricients, Euler's Cauchy method.	Series solution of Differential equation: Regular point, ordinary point, Power Series method. Frobenius method, Bessel and Legendre Equations, Legendre and Bessel functions and their properties , recurrence relations, orthogonality, Rodrigue's formula

Dr. Amrit pal singh PAPER-III LINEAR ALGEBRA	Elementary operation on matrices, Inverse of a matrix using Gauss Jordan Method. Linear independence of row and column vectors, Row rank, Column rank and their equivalence	Eigen values. Eigen vectors and the characteristic equation of a matrix, Diagonalization Cayley-Hamilton theorem and its use in finding inverse of a matrix, Consistency of a system of linear equations.	Vector spaces. Examples Linear dependence, Linear Combinations, Bases and dimension , Subspaces. linear transformations, Algebra of linear transformations	Matrices as linear transformations, Matrices and change of basis, Kernel and image, Rank and Nullity theorem.

Month-wise Schedule of B.Sc. (MATHEMATICS) Part I

SESSION 2022-23(SEMESTER-2)

Faculty Title of Paper	February	March	April	May
Dr. Jyotindra Thakur Paper - I Calculus-II	Double integrals,double integral in polar form, Change of order and change of variables in double integrals, Change of variables. Triple integrals in rectangular co-ordinates , Triple integrals incylindrical and spherical co-ordinates.	Applications to evaluation of areas, Volume, Centre of Gravity and Moments of Inertia	Vector in plane,cartesian co-ordinates and vectors in space, dot and cross products, lines and planes in space,line integrals , vector fields ,worl circulations , path independence.	Potential functions and conservative fields , Greens theorem in the Plane ,surface area and surface integrals, Stoke's theorem and Divergence theorem.
Dr. Jyotindra Thakur PAPER - II PARTIAL DIFFERENTIAL EQUATIONS	**Partial differential equations :** Partial differential equation of first order, Lagrange's solution, , Integral surfaces passing through a given curve, surfaces orthogonal to a given system of surfaces, Partial differential equation of first order but of any degree , Charpit's general method of solution.	Partial differential equations of second and higher order : Partial differential equations of the second order and their classification into hyperbolic, elliptic and parabolic types, canonical forms	Homogeneous and non-homogeneous partial differential equations with constant coefficients. One dimension Wave and Heat Equation.	Two dimensional Laplace equation by separation of variable method and D'Alembert's solution of wave equation.

| Dr. Amrit pal singh

PAPER-VI
ANALYTIC GEOMETRY | **General equation of second degree:**conic section ,centre of conic section,principal axes and eccentricity of a conic section , axis ,latus rectum ,vertex and focus of a parabola ,tracing of cones.
Polar equation of a conic : tracing of the conic ,chord joining two points ,tangents , normal,director circle and asymptotes. | **Introduction of oblique axes :**distance between two lines ,equation of line ,angle between two lines,length of perpendicular ,angle between the pair of lines , oblique axesfrom rectangular axes, invarients,equation of circle ,parabola ,ellipse,hyperbola | Sphere:Section of a sphere by plane, Sphere through a given circle, Intersection of a straight line and a sphere,tangent line and tangent plane to sphere, Angle of intersection of two spheres and condition of orthogonality | Cone:General equation of second degree represent a cone, its interception eith a plane and with a line ,enveloping cone, Right circular cone.
Cylinder: enveloping cylinder , Right circular cylinder. |

Month-wise Schedule of B.Sc. (MATHEMATICS) Part II

SESSION 2022-23(SEMESTER-3)

Faculty Title of Paper	September	October	November	December
Dr Jyotindra Thakur **PAPER-I ANALYSIS-I**	Definition of a sequence, Bounded and Monotonic sequences, Convergent sequence, Cauchy sequences, Cauchy's Convergence Criterion, Theorems on limits of sequences. Subsequence , Sequential continuity, Definition of a series, Test's of convergence (Without proofs) Comparison tests. Cauchy's integral Ratio tests. Raabe's, Logarithmic, Gauss Test, Cauchy's root test, Alternating series. Leibnitz's test.	Absolute and conditional convergence. Statement of Weierstrass M-Tests for Uniform convergence of sequence of functions and of series of functions. Simple applications. Determination of Radius of convergence of power series. Term by term integration and Term by term differentiation of power Series.	Partition ,Upper and lower sums, Upper and lower integrals, Riemann integrability, Condition of existence of Riemann integrability of continuous functions and of monotone functions ,Algebra of integrable functions	Definition ,Statements of their conditions of existence ,Test of the convergence of improper integral ,Beta and Gamma functions and their convergence , Abel`s and Dirichlet`s tests
Prof. Harjinder singh **PAPER-II: Linear Programming**	Formation of LPP, Graphical method , theory of Simplex method,standard form of LPP, Feasible solution ,basic feasible solution , optimality condition,unbounded solution ,alternative optimal solution ,corrospondance between BSF and extreme points ,simplex method , simplex algorithm,	Simplex method , simplex algorithm, Simplex Tableau , simplex method case of degeneracy, Big-M method ,infeasible solution, alternative solution ,solution of LPPfor unrestricted variable.	Formation of transportation problem , Concept of solutions ,Fesible solutions ,Finding initial basic feasible solution by north ewst corner method , matrix method , minima method ,Vogel` approximation method	Optimal solutions using MODI method Maximization, Minimization, unbalanced with restricted assignment problem , algorithm,,Hungarian method.

Mr Inderjeet Singh Paper-III: MECHANICS	Basic notation, Newton Laws of motion, system of two forces, parallelogram law of forces, resultant of two collinear forces, resolution of forces, moment of a force,	Couple, Theorem on moments of a couple, coplanar forces, resultant of three coplanar concurrent forces, theorem of resolved parts, resultant of two forces acting on a rigid body, Varignon's theorem, generalized theorem of moment, Equilibrium of two concurrent forces, equilibrium condition for any number of coplanar concurrent forces, Lami's theorem. λ - μ theorem, theorems of moments, resultant of a force and a copule. Equilibrium conditions for coplanar non-concurrent forces.	Motion of a particle with constant acceleration, acceleration of falling bodies, motion under gravity, motion of a body projected vertically upward, motion of a two particles connected by a string, motion along a smooth inclined plane, constrained motion along a smooth inclined plane. Variable acceleration, Simple harmonic motion, elastic string, simple pendulum.	Simple harmonic motion, elastic string, simple pendulum., Projectile.

Month-wise Schedule of B.Sc. (MATHEMATICS) Part II

SESSION2022-23(SEMESTER-4)

Faculty Title of Paper	February	March	April	May
Mr Inderjeet Singh Paper-IV: Analysis -II	Functions of bounded Variation and Rectifiable Curves: Properties of Monotonic Functions, Functions of Bounded Variation, Total variation, Additive property of total variation, Total Variation on [a, x] as a function of x, functions of bounded variation expressed as the difference of increasing functions, continuous functions of bounded variation	rectifiable curves and arc length,Additive and continuity property of arc lengths , equivalance of paths and change of parameter.	The riemann-stieltjes integrals:definition ,elementary properties , integration by parts ,change of variable, reduction to Riemann integral, step functions as integrators,reduction of Riemann's conditions, comparison theorem, integration of bounded variation.	mean value theorems for Riemann- stieltjes integrals, fundamental theorem of integral calcus, mean value theorem for Riemann integrals
Dr Jyotindra Thakur PAPER-V: Numerical methods	Measure of errors: relative, absolute and percentage errors, types of erroers ,inherent error, round off erroe and truncation error, Bisection Method, Regula-falsi method, Sectant method, Fixed – point iteration and Newton-Raphson method and convergence of Secant, Newton- Raphson method and fixed-point iteration.	Linear system of equations : Gauss-Elimination, pivoting element, Pivoting strategies, Partial and complete pivoting , Gauss Jordan and Triangularisation method, Jacobi Method, Gauss Seidel Method	Interpolation: Finite differences, Divided differences, Newton Gregory Forward and Backward formula, Lagrange's formula, Newton's formulae, Central Differences	Stirling, Bessel's and Everett's formulae, Error in linear and quadratic interpolation.

Prof. Harjinder singh PAPER-VI: Number theory	Divisibility , greatest comman divisor , fundamental theorem of arithmetic , congurances	Residue classes and reduced residue classes, euler-fermat theorem, wilison's theorem, linear congurances , Chinese remainder theorem	An application to cryptography , primitive roots , indices , quadratic residues,legendre symbols, euler;s certerion ,gauss lemma	Quadratic recitrocity law, jacobi symbol, arithmetic functions u(n),d(n) ,mobious inversion formula.

Month-wise Schedule of B.Sc. (MATHEMATICS) Part III

SESSION 2022-23(SEMESTER-5)

Faculty Title of Paper	September	October	November	December
Dr Jyotindra Thakur PAPER-I Abstract algebra	Group:definition and examples, subgroup counting principles Lagrange's theorem	Normal subgroups,quoitent subgroups,homomorphism, fundamental theorem of homomophism,and related theorem,cyclic groups.	Rings: definations and examples of rings ,elementary properties of rings ,sub rings , homomorphism ,ideals and quotient rings .	Field of quoitent of integral domain,division rings ,Euclidean domains , principal ideals ,examples
Mr Inderjeet Singh Paper-II: Mathematical methods -1	Defination of laplace transform,linearity property ,piecewise continuous function , existance of laplace transform, functions of class a, fiest and second shifting theorems of laplace transform,change of scale property,laplace transform of derivatives.	Initial value problems ,laplace transform of integrals,multiplication by t,division by t,laplace transform of periodic functions and error function ,beta function and gamma function ,definition of inverse laplace transform , linearity property , first and second shifting of inverse laplace transform,,change of scale property , division by p.	Convolution theorem,heavside's expansion formula (with proofs and applications),applications of laplace transform of the solution of ordinary differential equations with constant cofficients and variable cofficients .	Simultaneous ordinary differential equations ,second order partial differential equations(heat equations,wave equations and laplace equations)

Mr Inderjeet Singh OPTION-I discrete mathematics -1	Principles of inclusions and exclusions,computability and formal languages-ordered sets,phrase structure grammars,types of grammars and languages	Permutations ,combinations,discrete probability ,pelations and functions ,binary relations ,equivalance relations and partitions partial order relations.	Chains and antichains ,pigeon hole principle,graphs and planar graphs -basic terminology,multigraphs, weighted graphs .	Paths and circuit ,shortest paths ,eulerian paths and circuits, travlling salesman problem ,planar graphs trees.

Month-wise Schedule of B.Sc. (MATHEMATICS) Part III

SESSION 2022-23(SEMESTER-6)

Faculty Title of Paper	February	March	April	May
Mr Inderjeet Singh Paper-VI Optimization tectniques	Inventory, costs involed in inventory,variables in inventory mobels,characteristicsof inventory systems and classifications, concept of economic ordering (EOQ), EOQ models with no shortage,economic lot size system with uniform demand,economic lot size with different rates od demand in different cycles ,economic lot size with finite of replenishment.	EOQ models with shortages :EOQ with constant rates of demand, scheduling time constant and schudling time variable,production lot size demand with shortages..	Introduction to jobs sequencing n jobs on two machines , m jobs on three machines,two jobs on m machines,n jobs on m machines	Applications to solve some model equations:one dimensional heat equation ,one dimensional wave equation.
Dr Jyotindra Thakur PAPER-IV Mathematical methods -1I	Fourier series,theorems,dirichlet's conditions,fourier series for even and odd functions. Half range fourier series ,other forms of series Hankel transform: hankel integral formula,hankel transform,inverse theorem for hankel transform,hankel sine and cosinetransform and their inversion formula, linearity property of hankel transform	Fourier transform and its applications: dirichlet's condition ,fourier integral formula(without proof),fourier transform ,inverse theorem for fourier transform, fourier sine and cosine transform and their inversion formula,linearity property of fourier transforms, change of scale property	Shifting theorem,modulation theorem,convolution theorem of fourier transform,parseval;s identity ,finite fourier sine transform,inversion formula for sine transform, finite fourier cosine transform,inversion formula for cosine transform	Applications to solve some model equations:one dimensional heat equation ,one dimensional wave equation.

Mr Inderjeet Singh OPTION-III discrete mathematics - 1I	Analysis of algorithms-time complexity,complexity of problems.discrete numeric functions,generating functions,recurrence relations and recrusive algorithms linear recrrence relation with constan cofficient	Homogeneoussolutions ,particular solutions ,total solution,solution bt mehod of generating functions ,Boolean algebras -lattices and algebraic structures	Distributive and complemented lattices ,Boolean lattices and Boolean algebras, Boolean functions and expensions,prepositional calculus	Design and implementation of digital networks ,switching circuits