2018-19

Multani Mal Modi College, Patiala

Unit Planning M.Sc. Mathematics

Department of Mathematics

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: MM 401 (Algebra-I)

Max Marks: 75 **Maximum Time: 3 Hrs.**

TILLMST-I
Review of groups, subgroups, cosets, normal subgroups, quotient groups, homomorphisms and isomorphism theorems.Normal and subnormal series, Solvable groups, Nilpotent groups, Composition Series, Jordan-Holder theorem for groups. Group action, Stabilizer, orbit, Review of class equation, permutation groups, cyclic decomposition, Alternating group An, Simplicity of An.
TILLMST-II
Structure theory of groups, Fundamental theorem of finitely generated abelian groups, Invariants of a finite abelian group, Groups of Automorphisms of cyclic groups, homomorphism between two cyclic groups,Sylow's theorems, Groups of order p2, pq. Review of rings and homomorphism of rings, Ideals, Algebra of Ideals, Maximal and prime ideals, Ideal in Quotient rings, Field of Quotients of integral Domain, Matrix Rings and their ideals.
TILLFINAL EXAM
Rings of Endomorphisms of Abelian Groups.

Mode of Assessment

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: MM 402 (Mathematical Analysis)

Max Marks: 75 **Maximum Time: 3 Hrs.**

TILLMST-I
Functional of several variables: Linear transformations, Derivatives in an open subset of Rn ,

Chain Rule, Partial derivatives, Interchange of the order of differentiation, Derivatives of higher orders, Taylor's theorem, Inverse function theorem, Implicit function theorem. Algebras, σ- algebra, their properties, General measurable spaces, measure spaces, properties of measure, Complete measure, Lebesgue outer measure and its properties, measurable sets and Lebesque measure, A non measurable set.
TILLMST-II
Measurable function w.r.t. general measure.Borel and Lebesgue measurability. Integration of non-negative measurable functions, Fatou's lemma, Monotone convergence theorem, Lebesgue convergence theorem, The general integral, Integration of series, Riemann and lebesgue integrals. Differentiation; Vitalis Lemma, The Dini derivatives, Functions of bounded variation, Differentiation of an Integral,
TILLFINAL EXAM
Absolute Continuity, Convex Fucntions and Jensen's inequality

Mode of Assessment

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Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: MM 403(Topology-I)

Max Marks: 75 **Maximum Time: 3 Hrs.**

TILLMST-I
Cardinals: Equipotent sets, Countable and Uncountable sets, Cardinal Numbers and their Arithmetic, Bernstein's Theorem and the Continumm Hypothesis. Topological Spaces: Definition and examples, Euclidean spaces as topological spaces, Basis for a given topology, Topologizing of Sets; Sub-basis, Equivalent Basis. Elementary Concepts: Closure, Interior, Frontier and Dense Sets, Topologizing with pre-assigned elementary operations. Relativization, Subspaces. Maps and Product Spaces: Continuous Maps, Restriction of Domain and Range, Characterization of Continuity, Continuity at a point, Piecewise definition of Maps and Neighborhood finite families. Open Maps and Closed Maps, Homeomorphisms and Embeddings.
TILLMST-II
Cartesian Product Topology, Elementary Concepts in Product Spaces, Continuity of Maps in Product Spaces and Slices in Cartesian Products. Connectedness: Connectedness and its characterizations, Continuous image of connected sets, Connectedness of Product Spaces, Applications to Euclidean spaces. Components, Local Connectedness and Components, Product of Locally Connected Spaces.Path Connectedness. Compactness and Countability: Compactness and Countable Compactness, Local Compactness, One-point Compactification, T0, T1, and T2 spaces, T2 spaces and Sequences and Hausdorfness of One-Point Compactification.
TILLFINAL EXAM
Axioms of Countablity and Separability, Equivalence of Second axiom, Separable and Lindelof in Metric Spaces. Equivalence of Compact and Countably Compact Sets in Metric Spaces.

Mode of Assessment

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2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: MM 404 (Differential Geometry)

Max Marks: 75 **Maximum Time: 3 Hrs.**

TILLMST-I
TheoryofSpaceCurves: Curves in the planes and in space, arc length, reparametrization, curvature, Serret-Frenetformulae.osculatingcircles,evolutes and involutes of curves, space curves, torsion, Serret-Frenet formulae. TheoryofSurfaces, smooth surfaces, tangents, normals and orientability, quadric surfaces, the first and the second fundamental forms, Euler's theorem. Rodrigue'sformula. Gaussian Curvature, Gauss map and Geodesics: The Gaussian and mean curvatures, the pseudosphere, flat surfaces, surfaces of constant mean curvature.
TILLMST-II
Gaussian curvature of compact surfaces, the Gauss map, Geodesics, geodesic equations, geodesics of surfaces of revolution, geodesics as shortest paths, geodesic coordinates.Minimal Surfaces and Gauss's Remarkable Theorem: Plateau's problem, examples of minimal surfaces, Gauss map of a minimal surface, minimal surfaces and holomorphic functions, Gauss's Remarkable Theorem, isometries of surfaces,
TILLFINAL EXAM
The Codazzi-Mainardi Equations, compact surface of constant Gaussian curvature

Mode of Assessment

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Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: CS-405 (Introduction to Computer and Programming using C)

Max Marks: 75 **Maximum Time: 3 Hrs.**

TILLMST-I

Characterization of Computers, types of Computers, the Computer generations. Basic Anatomy of Computers: memory unit, input-output unit, arithmetic logic unit, control unit, central processing unit, RAM, ROM, PROM, EPROM. Input-Output Devices

Computer Software: Introduction, types of software: application and systems software. Networking: Basics, types of networks (LAN, WAN, MAN), topologies, communication media, Operating System, Definition, functions and types of operating system.

Computer Languages: Machine Language, assembly language, high level language, 4GL, assembler, compiler and interpreter

Problem Identification, Analysis, Flowcharts, Decision tables, Pseudo codes and algorithms, Program coding, Program Testing and execution,

C Programming: character set, Identifiers and keywords, Data types, Declarations, Statement and symbolic constants, Input-output statements, Preprocessor commands,

Operators and Expressions: Arithmetic, relational, logical, unary operators, others operators, Bitwise operators: AND, OR, complement precedence and Associating bitwise shift operators, Input-Output: standard, console and string functions

TILLMST-II

Control statements: Branching, looping using for, while and do-while Statements, Nested control structures, switch, break, continue statements.

Functions: Declaration, Definition, Call, passing arguments, call by value, call by reference, Recursion, Use of library functions; Storage classes: automatic, external and static variables.

Arrays: Defining and processing arrays, Passing array to a function, Using multidimensional arrays, Solving matrices problem using arrays.

Strings: Declaration, Operations on strings.

Pointers: Pointer data type, pointers and arrays, pointers and functions.
TILLFINAL EXAM
Structures: Using structures, arrays of structures and arrays in structures, union

Mode of Assessment

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2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1)

Subject: MM-405 (B): SOFTWARE LABORATORY (C-Programming)

This laboratory course will mainly comprise of exercises on what is learnt under the paper," Computer Programming using C".

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1I)

Subject:MM 501(Algebra-II (Rings And Modules))

TILLMST-I
Unique Factorization Domains, Principal Ideal Domains, Euclidean Domains, Polynomial Rings over UFD, Rings of Fractions. (RR1: Ch. 11 and Section 1 of Chapter 12). Modules: Definition and Examples, Submodules, Direct sum of submodules, Free modules, Difference between modules and vector spaces, Quotient modules, Homomorphism, Simple modules, Modules over PID. (RR2: Chapter 5)
TILLMST-II

Modules with chain conditions: Artinian Modules, Noetherian Modules, composition series of a module, Length of a module, Hilbert Basis Theorem (RR2: Chapter 6). Cohen Theorem, Radical Ideal, Nil Radical.
TILLFINAL EXAM
Jacobson Radical, Radical of an Artinian ring. (RR2: Chapter 6)

Mode of Assessment

Mode of Assessment		
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2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1I)

Subject: MM 502: TOPOLOGY II

TILLMST-I
Higher Separation Axioms : Regular, Completely Regular, Normal and Completely Normal Spaces. Metric Spaces as Completely Normal T_2 Spaces. Urysohns Lemma and The Tietze Extension Theorem. Products : Products of first countable, Regular, T_2 and Completely Regular Spaces. Non invariance of normality under products. Embedding of Tichonov spaces into parallelotope and the Stone Cech Compactification. Filters :Filter and filterbase, convergence and clustering, filter characterization of closure, continuity and filter convergence, ultrafilters, filter characterization of compactness and the Tychonoff
TILLMST-II
Identification Topology: Identification Topology, Identification Map, Subspaces, General

Theorem, Transgression, Transitivity Spaces with Equivalance Relation, Quotient Spaces. Categories and Functors: Categories: Definition and Examples, The Arrow Category, Congruence in a Category, Quotient Category, Functors, Duality, Contravariance and Duality, Homotopy as Congruence in Top, The Category hTop, homotopy equivalence, nullhomotopy, convexity.
TILLFINAL EXAM
contractibility and cones, the path component functor, invariance of path components

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
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2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1I)

MM 503: DIFFERENTIAL EQUATIONS-I

TILLMST-I
Existence of solution of ODE of first order, initial value problem, Ascoli's Lemma, Gronwall's inequality, Cauchy Peano Existence Theorem, Uniqueness of Solutions. Method of successive approximations, Existence and Uniqueness Theorem. System of differential equations, nth order differential equation, Existence and Uniqueness of solutions, dependence of solutions on initial conditions and parameters. Linear system of equations (homogeneous & non homogeneous). Superposition principle,
TILLMST-II
Fundamental set of solutions, Fundamental Matrix, Wronskian, Abel Liouville formula, Reduction of order, Adjoint systems and self adjoint systems of second order, Floquet Theory. Linear 2^{nd} order equations, preliminaries, Sturm's separation theorem, Sturm's fundamental comparison theorem, Sturm Liouville boundary value problem, Characteristic values & Characteristic functions,

TILLFINAL EXAM
Orthogonality of Characteristic functions, Expansion of a function in a series of orthonormal functions.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1I)

MM 504: FUNCTIONAL ANALYSIS

TILLMST-I
Normed Linear spaces, Banach spaces, Examples of Banach spaces and subspaces. Continuity of Linear maps, Equivalent norms. Normed spaces of bounded linear maps. Bounded Linear functional. Hahn-Banach theorem in Linear Spaces and its applications. Hahn-Banach theorem in normed linear spaces and its applications.Uniform boundedness principle, Open mapping theorem, Projections on Banach spaces, Closed graph theorem.
TILLMST-II
The conjugate of an operator. Dual spaces of lp and C [a,b], Reflexivity. Hilbert spaces, examples, Orthogonality, Orthonormal sets, Bessel's inequality, Parseval's theorem. The conjugate space of a Hilbert spaces. Adjoint operators, Self-adjoint operators, Normal and unitary operators. Projection operators. Spectrum of an operator, Spectral Theorem, Banach Fixed Point Theorem, Brower's Fixed Point Theorem. Schauder Fixed Point Theorem, Picards Theorem.
TILLFINAL EXAM
Applications of Fixed point theorem in differential equations and integral equations.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**

1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part 1 (Semester-1I)

MM 505: COMPLEX ANALYSIS

TILLMST-I
Function of complex variable, Analytic function, Cauchy-Riemann equations, Harmonic function and Harmonic conjugates, Branches of multivalued functions with reference to arg z, logz and z^c, Conformal Mapping. Complex Integration, Cauchy's theorem, Cauchy Goursat theorem Cauchy integral formula, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra, Maximum Modulus Principle. Schwarz lemma.
TILLMST-II
Taylor's theorem. Laurent series in an annulus. Singularities, Meromorphic function. Cauchy's theorem on residues. Application to evaluation of definite integrals. Principle of analytic continuation, General definition of an analytic function. Analytic continuation by power series method, Natural boundary, Harmonic functions on a disc, Schwarz Reflection principle
TILLFINAL EXAM
Mittag-Leffler's theorem (only in case when the set of isolated singularities admits the point at infinity alone as an accumulation point).

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
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2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-III)

MM 601: DIFFERENTIABLE MANIFOLDS

TILLMST-I
Differentiable Manifolds, examples of differentiable manifolds, Differentiable maps on manifolds, tangent vectors and tangent space, cotangent space, Vector Fields, Lie-bracket of vector fields. Jacobian of a map.Integral curves, Immersions and embeddings.Tensors and forms. Exterior product and Grassman algebra, Connections, Difference tensor, existence of parallelism and geodesics, covariant derivative, exterior derivative , Contraction, Lie-derivative.
TILLMST-II
Torsion tensor and curvature tensor of a connection, properties of torsion and curvature tensor, Bianchi's identities, Structure equations of Cartan. Riemannian manifolds, Fundamental theorem of Riemannian geometry, Riemannian connection. Riemannian curvature tensor and its properties. Bianchi's identities, Sectional curvature,
TILLFINAL EXAM
Theorem of Schur.Sub-manifolds and hyper-surfaces, Normals, induced connection, Gauss and Weingartan formulae.

Mode of Assessment

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-III)

Subject: MM 602: FIELD THEORY

TILLMST-I
Fields, examples, Algebraic and transcendental elements, Irreducible polynomials. Gauss Lemma, Eisenstein's criterion, Adjunction of roots, Kronecker's theorem, algebraic extensions, algebraically closed fields. Splitting fields, Normal extensions, multiple roots, finite fields, Separable extensions, perfect fields, primitive elements, Lagrange's theorem on primitive elements.
TILLMST-II
Automorphism groups and fixed fields, Galois extensions, Fundamental theorem of Galois theory, Fundamental theorem of algebra, Roots of unity and cyclotomic polynomials.
TILLFINAL EXAM
Cyclic extension, Polynomials solvable by radicals, Symmetric functions, cyclotomic extension, quintic equation and solvability by radicals

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-III)

Subject: MM 605: NUMERICAL ANALYSIS-I

TILLMST-I
Solution of Differential Equations: Tayler's series, Euler's method, Improved Euler method, Modified Euler method, and Runge-Kutta methods (upto fourth order), Predictor Corrector methods. Stability and convergence of Runge-Kutta and Predictor Corrector Methods. **Parabolic Equation:** Explicit and Implicit schemes for solution of one dimensional equations, Crank-Nicolson, Du fort and Frankel schemes for one dimension equations. Discussion of their compatibility, stability and convergence.Peaceman-Rachford A.D.I. scheme for two dimensional equations.
TILLMST-II
Elliptic Equation: Finite difference replacement and reduction to block tridiagonal form and its solution; DIrichlet and Neumann boundary conditions. Treatment of curved boundaries; Solution by A.D.I. method. **Hyperbolic equations:** Solution by finite difference methods on rectangular and characteristics grids and their stability. **Approximate methods:** Methods of weighted residual, collocation, Least-squares and Galerkin' s methods. Variational formulation of a given boundary value problem,

TILLFINAL EXAM
Ritz method. Simple examples from ODE and PDE.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-1II)

Subject: MM 609-ANALYTIC NUMBER THEORY

TILLMST-I
Arithmetical functions: Mobius function, Euler's totient function, Mangoldt function, Liouville's function, The divisor functions, Relation connecting φ and μ, product formula for $\varphi(n)$, Dirichlet product of arithmetical functions, Dirichlet inverses and Mobius inversion formula, Multiplicative functions, Dirichlet multiplication, The inverse of a completely multiplicative function, Generalized convolutions. Averages of arithmetical functions: The big oh notation, Asymptotic equality of functions, Euler's summation formula, Elementary asymptotic formulas, Average order of d(n), $\varphi(n)$,$\sigma_\alpha(n)$, $\mu(n)$, $\Lambda n)$, The Partial sums of a Dirichlet product, applications to $\mu(n)$ and $\Lambda(n)$, Legendre's identity.
Some elementary theorems on the distribution of prime numbers: Chebyshev's functions $\psi(x)$ &$\theta(x)$, Relation connecting $\theta(x)$ and $\pi(x)$, Abel's identity, equivalent forms of Prime number theorem, inequalities for $\pi(n)$ and P_n, Shapiro's Tauberian theorem, applications of Shapiro's theorem, Asymptotic formula for the partial sums $\Sigma_{p\leq x}(1/p)$. Elementary properties of groups , Characters of finite abelian groups, The character group, Orthogonality relations for characters, Dirichlet characters, Dirichlet's theorem for primes of the form
TILLFINAL EXAM
Dirichlet's theorem in primes on Arithmetical progression, Distribution of primes in Arithmetical progression.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)

2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-III)

Subject: MM 610-OPTIMIZATION TECHNIQUES-I

TILLMST-I
Introduction: Definition of operation research, models in operation research, general methods for solving O.R. models, Elementary theory of convex sets. **Linear Programming Problems:** Definition of LPP, examples of LPPs, mathematical formulation of the mathematical programming problems, Graphical solution of the problem. Simplex method, Big M method, Two Phase method, problem of degeneracy. **Duality in linear programming:** Concept of duality, fundamental properties of duality, duality theorems, complementary slackness theorem, duality and simplex method, dual simplex method. **Sensitivity Analysis:** Discrete changes in the cost vector, requirement vector and co-efficient matrix, addition of a new variable, deletion of a variable, addition of new constraint, deletion of a constraint. **Integer Programming:** Introduction, Gomory's all-IPP method, Gomory's mixed-integer method, Branch and Bound method.
TILLMST-II
Transportation Problem: Introduction, mathematical formulation of the problem, initial basic feasible solution using North West Corner Method, Least Cost Method and Vogel's Approximation Method, Optimal solution using MODI method, degeneracy in transportation problems, some exceptional cases in transportation problems, **Assignment Problems:** Introduction, mathematical formulation of an assignment problem, assignment algorithm, unbalanced assignment problems, Travelling Salesman problem.
TILLFINAL EXAM
Games & Strategies: Definition & characteristics of Games. Two person zero sum games, Maximin-minimax principle, Games without saddle points, Mixed Strategies, Graphical method for solving and games, Concept of Dominance, Reducing the game problem to LPP, Limitations.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-1V)

Subject:MM 702 -THEORY OF LINEAR OPERATORS

TILLMST-I
Spectral theory in normed linear spaces, resolvant set and spectrum. Spectral properties of bounded linear operator. Properties of resolvant and spectrum. Spectral mapping theorem for polynomials, spectral radius of bounded linear operator on a complex Banach space. Elementary theory of Banach algebras.Resolvant set and spectrum. Invertible elements, Resolvant equation.General properties of compact linear operators.
TILLMST-II
Spectral properties of compact linear operators on normed space. Behaviour of compact linear operators with respect to solvability of operator equations. Fredholm type theorems.Fredholm alternative theorems. Spectral properties of bounded self-adjoint linear operators on a complex Hilbert space.Positive operators.Monotone sequence theorem for bounded self-adjoint operators on a complex Hilbert space.
TILLFINAL EXAM
Square roots of positive operators.Spectral family of a bounded self-adjoint linear operator and its properties, Spectral theorem.

Mode of Assessment

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class – M.Sc. Mathematics Part II (Semester-1V)

Subject: MM 705: Optimization Techniques –II

TILLMST-I
Quadratic Programming: Wolfe's Modified Simplex Method, Beale's method for Quadratic Programming, Separable, Convex programming. **Linear Complimentary Problem**: Lemke's Complementary Pivoting Algorithm, Solution of Quadratic programming, Problems using Linear Complementary method. **Separable Programming**: Introduction, Reduction of Separable Programming to Linear programming Problem, Separable Programming Algorithm. **Goal Programming**: Introduction, formulation of linear Goal Programming, Graphical & Simplex Method for Goal Programming.
TILLMST-II
Geometric Programming: Introduction, constrained & unconstrained Geometric Programming Problem, Complementary Geometric programming. **Fractional Programming:** Introduction, Mathematical formulation of Linear fractional programming problem, Method due to Charnes and Cooper, Problems of Fractional Programming. **Dynamic Programming**: Introduction, nature of Dynamic Programming (DP), Solution of Discrete DPP, Application of DP in Linear Programming.
TILLFINAL EXAM
Decision Theory: Introduction & components of Decision Theory, EMV,EOL, Decision making under uncertainty, Decision making under utilities, Decision making under Risk. **Simulation:** Introduction, Advantages & disadvantages, Event –type, Monte-Carlo simulation, Application to Inventory, Queueing, Capital Budgeting, Financial Planning, Maintenance, Job Sequencing, Networks.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc. Mathematics Part II (Semester-IV)

TILLMST-I
Introduction to error-correcting codes, The main coding theory problem, An introduction to finite fields, Introduction-to Linear codes, Encoding & Decoding with a linear code. The dual code, the parity-check matrix and syndrome decoding, incomplete decoding.
TILLMST-II
Hamming codes, extended binary Hamming codes, Q-ary Hamming codes, Perfect codes, sphere
TILLFINAL EXAM
Cyclic codes, Hamming codes as cyclic codes, BCH codes, Quadratic residue codes.

Mode of Assessment

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc. Mathematics Part II (Semester-IV)

Subject: MM 710- Commutative Algebra

TILLMST-I
Nil radical and Jacobson radical of Ring, Operation on ideals, Extension and Contraction of Ideals, The Prime Spectrum of Ring, Zairiski Topology Exact sequence of Modules, Tensor product of modules, Restriction and Extension of Scalars, Exactness property of Tensor product, Flat Modules, Tensor product of Algebras.
TILLMST-II
Rings and Modules of Fractions, Local properties, Extended and Contracted ideals in rigs of Fractions. Primary decomposition : Primary ideals, Decomposable Ideals, First Uniqueness Theorem, Isolated prime ideals,

TILLFINAL EXAM
Second Uniqueness Theorem, behavior of primary ideals under localization.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%

MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc. Mathematics Part II (Semester-1V)

MM 716-MATHEMATICAL METHODS

TILLMST-I
Linear integral equations of first and second kind, Abel's problem, Relation between linear differential equation and Volterra's equation, Non linear and Singular equations, Solution by successive substitutions, Volterra's equation, iterated and reciprocal functions, Volterra's solution of Fredholm's equation. Fredholm's equation as limit of finite system of linear equations, Hadamard's theorem, convergence proof, Fredholm's two fundamental relations, Fredholm's solution of integral equation when $D(\lambda)\neq 0$,Fredholm's solution of Dirichlet's problem and Neumann's problem, Lemmas on iterations of symmetric kernel, Schwarz's inequality and its applications
Simple variational problems, Necessary condition for an extremum, Euler's equation, End point problem, Variational derivative, Invariance of Euler's equation, Fixed end point problem for nunknown functions, Variational problem in parametric form, Functionals depending on higher order derivatives
TILLFINAL EXAM
Euler Lagrange equation, First integral of Euler-Lagrange equation, Geodesics, The brachistochrone, Minimum surface of revolution, Brachistochrone from a given curve to a fixedpoint, Snell's law, Fermat's principle and calculus of variations.

Mode of Assessment		
Sr. No.	**Component**	**Weightage**
1	Mid Semester Test (MST)	40% (Average of 2 MST)
2	Written Assignments	40%
3	Attendance	20%