

2016
-17

Multani Mal Modi College, Patiala

Unit Planning MSc Mathematics – 1&2

Department of Mathematics



MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-Ist)

Subject: MM 401: ALGEBRA – 1

(2016-17)

| TILLMST-I |
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| 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 A_n , Simplicity of A_n . |
| TILLMST-II |
| Structure theory of groups, Fundamental theorem of finitely generated abelian groups, Invariants of a finite abelian group, Sylow's theorems, Groups of order p^2 , pq . Review of rings and homomorphism of rings, Ideals, Algebra of Ideals, Maximal and prime ideals, ideal in Quotient rings, |
| TILLFINAL EXAM |
| Field of Quotients of integral Domain |

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

UNIT PLANNING (SESSION 2016-17)
MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-Ist)

Subject: MM 402: MATHEMATICAL ANALYSIS

(2016-17)

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| TILLMST-I |
| Functional of several variables: Linear transformations, Derivatives in an open subset of \mathbb{R}^n , 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 Lebesgue 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 Functions and Jensen's inequality. |

| Mode of Assessment | | |
|---------------------------|-------------------------|------------------------|
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| 3 | Attendance | 20% |

UNIT PLANNING (SESSION 2016-17)
MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-Ist)

Subject: MM 403: TOPOLOGY I

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

| TILLMST-I |
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| <p><u>Cardinals:</u> Equipotent sets, Countable and Uncountable sets, Cardinal Numbers and their Arithmetic, Bernstein's Theorem and the Continuum Hypothesis.</p> <p><u>Topological Spaces:</u> Definition and examples, Euclidean spaces as topological spaces, Basis for a given topology, Topologizing of Sets; Sub-basis, Equivalent Basis.</p> <p><u>Elementary Concepts:</u> Closure, Interior, Frontier and Dense Sets, Topologizing with pre-assigned elementary operations. Relativization, Subspaces.</p> <p><u>Maps and Product Spaces:</u> 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</p> |
| TILLMST-II |
| <p><u>Cartesian Product Topology,</u> Elementary Concepts in Product Spaces, Continuity of Maps in Product Spaces and Slices in Cartesian Products.</p> <p><u>Connectedness:</u> 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.</p> <p><u>Compactness and Countability:</u> Compactness and Countable Compactness, Local Compactness, One-point Compactification, T_0, T_1, and T_2 spaces, T_2 spaces and Sequences and Hausdorffness of One-Point Compactification</p> |
| TILLFINAL EXAM |
| <p>Axioms of Countability and Separability, Equivalence of Second axiom, Separable and Lindelof in Metric Spaces. Equivalence of Compact and Countably Compact Sets in Metric Spaces</p> |

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

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-Ist)

Subject: MM 404 Differential Geometry

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

| TILLMST-I |
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| A simple arc, Curves and their parametric representation, arc length and natural parameter, contact of curves, Tangent to a curve, osculating plane, Frenettrihedron, Curvature and Torsion, SerretFrenet formulae, fundamental theorem for spaces curves, helices, contact between curves and surfaces. Evolute and involute, Bertrand Curves, spherical indicatrix, implicit equation of the surface, Tangent plane, the first fundamental form of a surface, length of tangent vector and angle between two tangent vectors, area of a surface |
| TILLMST-II |
| The second fundamental form, Gaussian map and Gaussian curvature, Gauss and Weingarten formulae, Codazzi equation and Gauss theorem, curvature of a curve on a surface, geodesic curvature. Geodesics, Canonical equations of geodesic, Normal properties of geodesics. Normal Curvature, principal curvature, Mean Curvature, principal directions, lines of curvature, Rodrigue formula, asymptotic Lines, conjugate directions, envelopes, developable surfaces associated with spaces curves, |
| TILLFINAL EXAM |
| minimal surfaces, ruled surfaces. |

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| 3 | Attendance | 20% |

UNIT PLANNING (SESSION 2016-17)
MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-Ist)

Subject: MM-405(A): Computer Programming using C

(2016-17)

| TILLMST-I |
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| <p>Problem Identification, Analysis, Flowcharts, Decision tables, Pseudo codes and algorithms, Program coding, Program Testing and execution, Modular Programming, Top-down and Bottom-up Approaches.</p> <p>Need of programming languages. C character set, Identifiers and keywords, Data types, Declarations, Statement and symbolic constants, Input-output statements, Preprocessor commands,</p> <p>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</p> <p>Control statements: Branching, looping using for, while and do-while Statements, Nested control structures, switch, break, continue statements</p> |
| TILLMST-II |
| <p>Functions: Declaration, Definition, Call, passing arguments, call by value, call by reference, Recursion, Use of library functions; Storage classes: automatic, external and static variables.</p> <p>Arrays: Defining and processing arrays, Passing array to a function, Using multidimensional arrays, Solving matrices problem using arrays.</p> <p>Strings: Declaration, Operations on strings.</p> <p>Pointers: Pointer data type, pointers and arrays, pointers and functions.</p> |
| TILLFINAL EXAM |
| <p>Structures: Using structures, arrays of structures and arrays in structures, union</p> |

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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: MSc I (SEMESTER-2nd)

MM 501: ALGEBRA-II (RINGS AND MODULES)

(2016-17)

| 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 |
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UNIT PLANNING (SESSION 2016-17)

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-2nd)
MM 502: TOPOLOGY II

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

TILLMST-I

Ordinal Numbers : Order types, Product of Order types, Well Ordered Sets, Similarity Mapping, Ordinal Numbers, Principle of Transfinite Induction, Comparability theorems of ordinal and cardinal numbers, Well Ordering of Ordinal Numbers, The first infinite and the first uncountable Ordinal, Statement of Well Ordering Theorem, Axiom of Choice and Zorn's Lemma. Burali-Forti Paradox. Crucial property of the first uncountable ordinal.

Higher Separation Axioms : Regular, Completely Regular, Normal and Completely Normal Spaces. Metric Spaces as Completely Normal T_2 Spaces. Urysohn's Lemma and The Tietze Extension Theorem. Point finite and Locally Finite families.

Products : Products of first countable, Regular, T_2 and Completely Regular Spaces. Non invariance of normality under products. Embedding of Tichonov spaces into paralleloptope and the Stone Cech Compactification.

TILLMST-II

Nets and Filters : Nets and Subnets, Convergence and Clustering of a net, Closures and Nets, Nets and Continuity, Nets in Products, Ultrafilter, Relationship between Nets and Filters, Nets and Filter Characterization of Compactness and The Tychonoff Theorem.

UNIT PLANNING (SESSION 2016-17)

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| <p><u>Identification Topology: Identification</u></p> <p>Topology, Identification Map, Subspaces, General Theorem, Transgression, Transitivity Spaces with Equivalence Relation, Quotient Spaces.</p> |
| TILLFINAL EXAM |
| <p>Cones and Suspensions, Attaching of Spaces, Adjunction Space, The relation $K(f)$ for continuous maps and Weak Topologies.</p> |

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-2nd)

MM 503: DIFFERENTIAL EQUATIONS-I

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

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| TILLMST-I |
| <p>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.</p> <p>Linear system of equations (homogeneous & non homogeneous). Superposition principle,</p> |
| TILLMST-II |
| <p>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 2nd order equations, preliminaries, Sturm's separation theorem, Sturm's fundamental comparison theorem,</p> |

UNIT PLANNING (SESSION 2016-17)

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| 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. |

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-2nd)

MM 504: FUNCTIONAL ANALYSIS

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

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| TILLMST-I |
| <p>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.</p> <p>Hahn-Banach theorem in normed linear spaces and its applications. Uniform boundedness principle, Open mapping theorem, Projections on Banach spaces, Closed graph theorem.</p> |
| TILLMST-II |
| <p>The conjugate of an operator. Dual spaces of l_p 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.</p> |
| TILLFINAL EXAM |
| Applications of Fixed point theorem in differential equations and integral equations. |

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class: MSc I (SEMESTER-2nd)

MM 505: COMPLEX ANALYSIS

(2016-17)

Max Marks: 70

Maximum Time: 3 Hrs.

| TILLMST-I |
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| Function of complex variable, Analytic function, Cauchy-Riemann equations, Harmonic function and Harmonic conjugates, Branches of multivalued functions with reference to $\arg z$, $\log z$ 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). |

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MULTANI MAL MODI COLLEGE, PATIALA**UNIT PLAN****Class – M.Sc.-II(SEMESTER-3rd)****MM 601 : DIFFERENTIABLE MANIFOLDS**

Max Marks: 75

Maximum Time: 3 Hrs.

| TILLMST-I |
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| 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. Curves and integral curves, Immersions and embeddings. existence of parallelism and geodesics, covariant derivative, exterior derivative contraction, Lie-derivative. |
| TILLMST-II |
| Exterior product and Grassman algebra, connections. Tensors and forms. Difference tensor, Torsion tensor and curvature tensor of a connection, properties of torsion and curvature tensor, Bianchi's identities, Cartan's approach and structure equations of cartan. Riemannian manifolds, Fundamental theorem of Riemannian geometry, Riemannian connection. |
| TILLFINAL EXAM |
| Riemannian curvature tensor and its properties. Bianchi's identities, Sectional curvature, Theorem of Schur, Sub-manifolds and hyper-surfaces, Normals, induced connection, Gauss and Weingarten formulae. |

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.-II (SEMESTER-3rd)

MM 604 : CATEGORY THEORY - I

Max Marks: 75

Maximum Time: 3 Hrs.

TILLMST-I

Categories: Introduction with Functions of Sets, Definition and examples of Categories: Sets, Pos, Rel, Mon, Groups, Top, Dis (X),. Finite Category, Abstract Mappings, Additive Categories, The category of modules, The concept of functor and the category Cat, Functors of several variables. Isomorphism. Constructions: Product of two categories, The Dual Category, The Arrow Category, The Slice and Co- Slice Category.

Free Categories: Free Monoids and their Universal Mapping Property, The category Graphs, the category $C(G)$ generated by a graph, Homomorphism of Graphs and the Universal Mapping Property of $C(g)$.

TILLMST-II

Abstract Structures: Epis and mono, Initial and Terminal objects, Generalized elements, Sections and Retractions, Product diagrams and their Universal Mapping Property, Uniqueness up to isomorphism, Examples of products: Product of Sets, Product in Cat, Poset, Product in Top. Categories with Products, Hom-Sets, Covariant representable functors, Functors preserving binary product.

Duality: The duality principle, Formal duality, Conceptual duality, Coproducts, Examples in Sets, Mon, Top, Coproduct of monoids, of Abelian Groups and Coproduct in the category of Abelian Groups. Equalizers, Equalizers as a monic, Coequalizers, Coequalizers as an epic. Coequalizer diagram for a monoid.

TILLFINAL EXAM

Groups and Categories: Groups in categories, topological group as a group in Top. The category of groups, Groups as categories, Congruence on a category, quotient category and its univalent mapping property, finitely presented categories.

Limits and Co-limits: Subjects, Pullbacks, Properties of Pullbacks, Pullback as a functor, Limits, Cone to a diagram, limit for a diagram, Co-cones and Colimits. Preservation of limits, contra variant functors. Direct limit of groups. Functors Creating limits and co-limits.

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc.-II(SEMESTER-3rd)

MM 605: NUMERICAL ANALYSIS-I

Max Marks: 75

Maximum Time: 3 Hrs.

TILLMST-I

Solution of Differential Equations: Taylor'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

| Mode of Assessment | | |
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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN

Class – M.Sc.-II(SEMESTER-3rd)
MM 609-ANALYTIC NUMBER THEORY

Max Marks: 75

Maximum Time: 3 Hrs.

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.

TILLMST-II

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 $\sum_{p \leq x} (1/p)$.

TILLFINAL EXAM

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 $4n-1$ and $4n+1$, Dirichlet's theorem in primes on Arithmetical progression, Distribution of primes in Arithmetical progression.

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc.-II (SEMESTER-3rd)

MM 706-MATHEMATICAL METHODS

Max Marks: 75

Maximum Time: 3 Hrs.

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

TILLMST-II

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 n-unknown 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 fixed point, Snell's law, Fermat's principle and calculus of variations.

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA**UNIT PLAN****Class – M.Sc.-II (SEMESTER-4th)****MM 702 -THEORY OF LINEAR OPERATORS****Max Marks: 75****Maximum Time: 3 Hrs.**

| TILLMST-I |
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| Spectral theory in normed linear spaces, resolvent set and spectrum. Spectral properties of bounded linear operator. Properties of resolvent and spectrum. Spectral mapping theorem for polynomials, spectral radius of bounded linear operator on a complex Banach space. Elementary theory of Banach algebras. Resolvent set and spectrum. Invertible elements, Resolvent equation. General properties of compact linear operators. Spectral properties of compact linear operators on normed space. |
| TILLMST-II |
| 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. Square roots of positive operators. |
| TILLFINAL EXAM |
| Spectral family of a bounded self-adjoint linear operator and its properties, Spectral theorem. |

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc.-II (SEMESTER-4th)
MM 703 - GEOMETRY OF DIFFERENTIABLE MANIFOLDS

Max Marks: 75

Maximum Time: 3 Hrs.

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| TILLMST-I |
| Topological groups, Lie groups and Lie algebras. Product of two Liegroups, One parameter subgroups and exponential maps. Examples of Lie groups, Homomorphism and Isomorphism, Lie transformation groups, General Linear groups. Principal fibre bundle, Linear frame bundle, Associated fibre bundle, |
| TILLMST-II |
| Vector bundle, Tangent bundle, Bundle homomorphism. Sub-manifolds, induced connection and second fundamental form. Normals, Gauss formulae, Weingarten equations, Lines of curvature, Gauss and Mainardi–Codazzi equations. Almost Complex manifolds , Nijenhuis tensor |
| TILLFINAL EXAM |
| Contravariant and covariant almost analytic vector fields, F-connection. |

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – M.Sc.-II (SEMESTER-4th)
MM 709: ALGEBRAIC CODING THEORY

Max Marks: 75

Maximum Time: 3 Hrs.

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| 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 |

UNIT PLANNING (SESSION 2016-17)

Hamming codes, extended binary Hamming codes, Q-ary Hamming codes. Perfect codes, Golay codes, sphere packing bound.

TILLFINAL EXAM

Cyclic codes, Hamming codes as cyclic codes, BCH codes, Quadratic residue codes

Mode of Assessment

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MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class – M.Sc.-II (SEMESTER-4th)

MM 710- Commutative Algebra

Max Marks: 75

Maximum Time: 3 Hrs.

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,

TILLMST-II

Exactness property of Tensor product, Flat Modules, Tensor product of Algebras.

Rings and Modules of Fractions, Local properties, Extended and Contracted ideals in rigs of Fractions. Primary decomposition : Primary ideals.

TILLFINAL EXAM

Decomposable Ideals, First Uniqueness Theorem, Isolated prime ideals, Second Uniqueness Theorem, behavior of primary ideals under localization.

Mode of Assessment

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

UNIT PLANNING (SESSION 2016-17)

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|---|-------------------------|------------------------|
| 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.-II (SEMESTER-4th)

MM-714: NUMERICAL ANALYSIS-II

Max Marks: 75

Maximum Time: 3 Hrs.

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|---|
| TILLMST-I |
| Introduction to Hermite interpolation and computation of piecewise cubic Hermite polynomials, Piecewise Hermite interpolation and computation of piecewise Hermite polynomials, HermiteBirkhoff interpolation problem, Runge example. Piecewise cubic Bessel interpolation. Basic properties of splines. |
| Construction of local basis.B-splines.Equally spaced knots.PerfectBsplines. Dual basis. Zero properties. Sign properties of green's function.Derivatives, piecewise polynomial representation. Piecewise constants and linear function.Direct theorems in intermediate spaces. |
| TILLFINAL EXAM |
| Lower bounds.N-Widths Periodic splines, natural splines, g-splines, monosplines, discrete splines. Green's function, Tchebycheffian spline functions. |

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% |

M. M. Modi College, Patiala