SYLLABUS M.SC MATHEMATICS – II SEMESTER
Advanced Abstract Algebra —II
MAT-201

Unit- I

Introduction to Modules, Sub modules quotient modules, Module Homomorphism, Isomorphism, Finitely generated modules, cyclic modules.

Unit – II

Simple modules, Semi simple modules, Free modules, Schur's lemma.

Unit – III

Noetherian & Artinian modules and rings, Hilbert basis theorem, Wedderburn-Artin theorem.

Unit – IV

Uniform modules, Primary modules, Noether-Laskar theorem, Fundamental structure theorem of modules over a principal ideal domain and its applications to finitely generated abelian groups.

Unit – V

Similarity of linear transformation, Invariant spaces, Reduction to triangular forms, Nilpotent transformations, Index of Nillpotency, Invariants of a nilpotent transformation, The primary Decomposition theorem.

Text Book :-
1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi.
2. V. Sahai & V. Bisht, Algebra, Narosa Publishing House.

Reference:-
1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press.
2. N. Jacobson, Basic Algebra, vol. II & VIII, Hindustan Publishing Company.
3. S. Lang, Algebra, Addison- Wesley.
4. I. S. Luther & I.B.S. Passi Algebra Vol-1,2,3, Narosa company.
5. Dr. H. K. Pathak Advanced Abstract Algebra.

M.Sc. (Mathematics) II Semester Syllabus 2022-23

SYLLABUS M.SC MATHEMATICS – II SEMESTER
Lebesgue Measure & Integration
MAT-202

Unit — I

Lebesgue outer measure, Measurable sets, Regularity, Measurable functions, Borel and Lebesgue measurability, Non-measurable sets.

Unit – II

Integration of Non-negative functions, The General integral, Integration of Series, Reimann and Lebesgue Integrals.

Unit – III

The Four derivatives, Functions of Bounded variation, Lebesgue Differentiation Theorem, Differentiation and Integration.

Unit - IV

The LP-spaces, Convex functions, Jensen's inequality, Holder and Minkowski inequalities and Completeness of L P.

Unit – V

Dual of space when $1 < p <$ convergence in Measure, Uniform Convergence and almost uniform convergence.

Text Book :-
1. Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill International student edition.
2. H.L. Royden, Real Analysis, Macmillan Indian Edition.

Reference:-
1. G. de Barra**,** Measure Theory and Integration**,** Wiley Eastern (Indian Edition)

M.Sc. (Mathematics) II Semester Syllabus 2022-23

SYLLABUS M.SC MATHEMATICS – II SEMESTER
Topology- II
MAT-203

Unit ─ I
Separation axioms TO,T1,T2,T3,T4 : their Characterizations and basic properties, Urysohn's lemma, Tietze extension theorem.

Unit – II
Compactness, Continuous functions and compact sets, Basic properties of compactness, Compactness and finite intersection property, Sequentially and countably compact compact sets, Local compactness and one point compactification, Stone-vech compactification, Compactness in metric spaces, Equivalence of compactness, countable compactness and one point compactification, Stone-vech compactification, Compactness in metric spaces, Equivalence of compactness, countable compactness and sequential compactness in metric spaces, Connected spaces, Connectedness on the line, Components, Locally connected spaces.

Unit – III
Tychonoff product topology in terms of standard sub-base and its characterizations, Projection maps, Separation axioms and product spaces, Connectedness and product spaces, Compactness and product spaces (Tychonoff s theorem), Countability and product spaces.

Unit - IV
Embedding and metrization**,** Embedding lemma and Tychonoff embedding**,** The Urysohn metrization theorem**,** Net and filters**,** Topology and convergence of Nets, Hausdorffness and Nets. Compactness and Nets**,** Filters and their convergence**,** Canonical way of Converting Nets to filters and vice-versa**,** Ultra-filters and Compactness.

Unit – V
The fundamental group and covering spaces-Homotopy of paths**,** The fundamental group**,** Covering spaces**,** The fundamental group of the circle and the fundamental theorem of algebra.

Text Books:-
1. J. R. Munkres, Topology- A first course, Prentice- Hall of India.

References:-
1. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill.
2. K.D. Joshi: Introduction to general topology, Wiley Eastern.
3. Dr. H.K Pathak Introduction to general topology.

M.Sc. (Mathematics) II Semester Syllabus 2022-23

SYLLABUS M.SC MATHEMATICS – II SEMESTER
Complex Analysis –II
MAT-204

Unit — I

Weierstrass factorization theorem, Gamma and its properties, Riemann Zeta function, Riemann's Functional equation.

Unit – II

Runge's Theorem, Mittag-Leffler's theorem, Analytic continuation, Uniqueness of direct analytic continuation, Uniqueness of analytic continuation along a curve, Power series method of analytic continuation.

Unit – III

Schwartz reflection principle, Monodromy theorem and its consequences, Harmonic function on a disc.

Unit - IV

Harnax inequality and theorem, Dirichlet problem, Green's function, Canonical products, Jenson's formula, Hadamard's three circles theorem, Order of an entire function, Exponent of convergence, Borels theorem, Hadamard's factorization theorem.

Unit – V

The range of an analytic function, Bloch's theorem, The little Picard theorem, Schottky's theorem, Montel Caratheodary and Great Picard theorem, Univalent function, Bieberbach Conjecture and The $\frac{1}{4}$ −theorem.

Text Book:-
1. J.B. Convey, Functions of one complex variable, Spring verlag.

References:-
1. S. Ponnuswamy, Foundation of complex analysis, Narosa Publishing House.
2. L.V. Ahlfors. Complex analysis McGraw Hill.
3. Dr .H.K. Pathak Complex analysis.

M.Sc. (Mathematics) II Semester Syllabus 2022-23

SYLLABUS M.SC MATHEMATICS – II SEMESTER
Advanced Discrete Mathematics-II
MAT-205

Unit ─ I

Directed graphs, in degree and Out degree of a vertex, Weighted undirected graphs, Dijkrtra's algorithm, Strong connectivity and Washell's algorithm, Directed trees, Search trees, Traversals tree.

Unit – II

Introductory Computability theory-Finite State Machines and their Transition, Table Diagrams, Equivalence of Finite State Machines, Reduced Machines, Homomorphism, Finite Automata, Acceptors.

Unit – III

Non-Deterministic Finite Automata and Equivalence of its power to that of Deterministic Finite Automata, Moore and Mealy Machines.

Unit - IV

Turing Machine and Partial Recursive Functions, Grammars and Languages-Phrase-Structure Grammars, Rewriting Rules, Derivations.

Unit – V

Sentential Forms, Language generated by grammar, Regular, Context-Free and Context Sensitive Grammars and Languages, Regular sets, Regular Expressions and the Pumping Lemma, Kleene's Theorem, Notions of Syntax Analysis, Polish Notations, Conversion of Infix expressions to Polish Notation.

Text Books :-
1. J.P Tremblay and Manohar, Discrete Mathematical structures, McGraw Hill.

References:-
1. C.L. Liu , Element of Discrete Mathematic, McGraw Hill.
2. Semyour Lipschutz / More Lipson , Discrete Mathematic, McGraw Hill.

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