

Restructured Syllabi (w.e.f. 2014-15 admitted batch) M.A./M.Sc. Mathematics			
Course Number: Title of the paper	Internal Assessment Marks	Semester End Marks	Number of Credit Hours
First Year: First Semester: (All papers are compulsory) M101: Algebra – I M102: Real Analysis – I M103: Topology – I M104: Differential Equations - I M105: Lin. Alg. and Disc. Math.	15	85	4
Second Semester: (All papers are compulsory) M201: Algebra – II M202: Real Analysis – II M203: Topology – II M204: Complex Analysis M205: Graph Th and Coding Th (Non Core/CBCS For AU Students ONLY) M205: Graph Theory and Advanced Coding Theory (For affiliated Colleges ONLY)	15	85	4
Second Year: Third Semester: M301: Functional Analysis (Compulsory) M302: (Stream A) (For Optional 1) M302(1): Number Theory – I M302(2): Universal Algebra – I M302(3): Fuzzy Set Theory and Applications M303: (Stream B) (For Optional 2) M303(1): Lattice Theory – I M303(2): Operations Research M303(3): Mathematical Biology M304: (Stream C) (For Optional 3) M304(1): Commutative Algebra – I M304(2): Semigroups – I M304(3): Advanced Graph Th. M305: Lin Alg and Numb Th (Non Core/CBCS and For AU Students ONLY) Complex Analysis – II (For affiliated Colleges ONLY)	15	85	4
Fourth Semester: M401: Measure and Integration (Compulsory) M402: (Stream A) (For Optional 1) M402(1): Number Theory – II (Prerequisite Number Theory – I) M402(2): Universal Algebra – II (Prerequisite Universal Algebra – I) M402(3): Operator Theory M403: (Stream B) (For Optional 2) M403(1): Lattice Theory – II (Prerequisite Lattice Theory – I) M403(2): Formal Languages and Automata Theory M403(3): Banach Algebras M404: (Stream C) (For Optional 3) M404(1): Commutative Algebra–II (Prerequisite Commutative Algebra–I) M404(2): Semigroups – II (Prerequisite Semigroups – I) M404(3): Nonlinear Functional Analysis M405: Partial Differential Equations (Compulsory)	15	85	4
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Restructured Syllabi
(w.e.f. 2014-15 admitted batch)
M.A./M.Sc. Mathematics

First Year:

First Semester: (All papers are compulsory)

- M101: Algebra – I
- M102: Real Analysis – I
- M103: Topology – I
- M104: Differential Equations - I
- M105: Lin. Alg. and Disc. Math.

Second Semester: (All papers are compulsory)

- M201: Algebra – II
 - M202: Real Analysis – II
 - M203: Topology – II
 - M204: Complex Analysis
 - M205: Graph Th and Coding Th (**Non Core/CBCS For AU Students**)
 - M205: Graph Th and Advanced Coding Th (**Also for affiliated Colleges**)
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Second Year:

Third Semester:

- M301: Functional Analysis (**Compulsory**)
- M302: (Stream A) (**For Optional 1**)
 - M302(1): Number Theory – I
 - M302(2): Universal Algebra – I
 - M302(3): Fuzzy Set Theory and Applications
- M303: (Stream B) (**For Optional 2**)
 - M303(1): Lattice Theory – I
 - M303(2): Operations Research
 - M303(3): Mathematical Biology
- M304: (Stream C) (**For Optional 3**)
 - M304(1): Commutative Algebra – I
 - M304(2): Semigroups – I
 - M304(3): Advanced Graph Th.
- M305: Lin Alg and Numb Th (**Non Core/CBCS For AU Students ONLY**)
Complex Analysis – II (**For affiliated Colleges ONLY**)

Fourth Semester:

- M401: Measure and Integration (**Compulsory**)
 - M402: (Stream A) (**For Optional 1**)
 - M402(1): Number Theory – II (Prerequisite Number Theory – I)
 - M402(2): Universal Algebra – II (Prerequisite Universal Algebra – I)
 - M402(3): Operator Theory
 - M403: (Stream B) (**For Optional 2**)
 - M403(1): Lattice Theory – II (Prerequisite Lattice Theory – I)
 - M403(2): Formal Languages and Automata Theory
 - M403(3): Banach Algebras
 - M404: (Stream C) (**For Optional 3**)
 - M404(1): Commutative Algebra–II (Prerequisite Commutative Algebra–I)
 - M404(2): Semigroups – II (Prerequisite Semigroups – I)
 - M404(3): Nonlinear Functional Analysis
 - M405: Partial Differential Equations (**Compulsory**)
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ANNEXURE-I

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
I-SEMESTER

M101 ALGEBRA – I

(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Group Theory

Definition of a Group- Some Examples of Groups- Some preliminary Lemmas- Subgroups- A counting principle- Normal subgroups and Quotient Groups-Homomorphisms- Automorphisms. Chapters 2 sections 2.1 – 2.8.

UNIT-II

Group Theory

Cayley's Theorem- Permutation Groups- Another counting principle- Sylow's Theorem- Direct products- Finite Abelian Groups. Chapter 2 sections 2.9 – 2.14

UNIT-III

Ring Theory

Definition and Examples of Rings- Some special classes of Rings- Homomorphisms- Ideals and Quotient Rings- More Ideals and Quotient Rings- The Field of Quotients of an Integral Domain. Chapter 3 sections 3.1 – 3.6

UNIT-IV

Ring Theory

Euclidean Rings- A particular Euclidean Ring- Polynomial Rings- Polynomials over the Rational Field- Polynomial Rings over Commutative Rings.

Chapter 3 sections 3.7 – 3.11

Prescribed Book: Topics in Algebra: I. N. Herstein , Second edition, John Wiley & Sons

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
I-SEMESTER

M102 REAL ANALYSIS-I

(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Basic Topology: Finite, Countable, and Uncountable Sets, Metric spaces, Compact sets, Connected sets. (Chapter 2 of the text book)

UNIT-II

Numerical Sequences and Series: Convergent sequences, Subsequences, Cauchy sequences, Upper and Lower limits, Some special sequences, Series, Series of non-negative terms, number e , The Root and Ratio tests, Power series, Summation by parts, Absolute Convergence, Addition and Multiplication of series, Rearrangements. (Chapter 3 of the text book)

UNIT-III

Continuity: Limits of Functions, Continuous Functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotone Functions, Infinite Limits and Limits at Infinity. (Chapter 4 of the text book)

UNIT-IV

Differentiation: The Derivative of a Real Function, Mean Value Theorems, The Continuity of Derivatives, L' Hospital's Rule, Derivatives of Higher order, Taylor's theorem, Differentiation of Vector-valued Functions. (Chapter 5 of the text book)

Text Book: Principles of Mathematical Analysis by Walter Rudin, International Student Edition, 3rd Edition, 1985.

Reference: Mathematical Analysis by Tom M. Apostol, Narosa Publishing House, 2nd Edition, 1985.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
I-SEMESTER
M103 TOPOLOGY-I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Sets and Functions: Sets and Set inclusion – The algebra of sets – Functions – Products of sets – Partitions and equivalence relations – Countable sets – Uncountable sets – Partially ordered sets and lattices. Chapter I: Sections 1 to 8.

UNIT-II

Metric spaces: The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's theorem – Continuous mappings. Chapter 2: Sections 9 to 13.

UNIT-III

Metric spaces (Continued): Spaces of continuous functions – Euclidean and unitary spaces.

Topological spaces: The definition and some examples – Elementary concepts – Open bases and open sub bases – Weak topologies – The function algebras $C(X, \mathbb{R})$ and $C(X, \mathbb{C})$. Chapter 2: Sections 14,15 and Chapter 3: 16 to 20.

UNIT-IV

Compactness: Compact spaces – Product of Spaces – Tychonoff's theorem and locally Compact spaces – Compactness for metric spaces – Ascoli theorem. Chapter 4: Sections 21 to 25.

Prescribed book: Introduction to Topology by G.F.Simmons, Mc.Graw-Hill book company.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
I-SEMESTER
M104 DEFFERENTIAL EQUATIONS
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Second order linear differential equations: Introduction-general solution of the homogeneous equation - Use of a known solution to find another - Homogeneous equation with constant coefficients - method of undetermined coefficients - method of variation of parameters
Chapter 3 (Sec 14-19) of prescribed text book.

UNIT-II

Oscillation theory and boundary value problems: Qualitative properties of solutions - The Sturm comparison theorem - Eigen values, Eigen functions and the vibrating string
Chapter 4 (Sec 22-24, Appendix A) of prescribed text book.

UNIT-III

Power series solutions: A review of power series-series solutions of first order equations-second order linear equations - ordinary points-regular singular points
Chapter 5 (Sec 25-29) of prescribed text book.

UNIT-IV

Systems of first order equations: Linear systems - Homogeneous linear systems with constant coefficients - Existence and Uniqueness of solutions - successive approximations - Picard's theorem - Some examples. Chapter 7 (Sec 36-38) and Chapter 11(Sec 55-56) of prescribed text book.

Text book: George F. Simmons, Differential Equations, Tata McGraw-Hill Publishing Company Limited, New Delhi.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
I-SEMESTER
M105 LINEAR ALGEBRA AND DISCRETE MATHEMATICS
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Elementary Canonical Forms: Introduction-Characteristic Values-Annihilating Polynomials-Invariant Subspaces. Sections 6.1, 6.2, 6.3, 6.4, of chapter 6 in Prescribed Text book I

UNIT-II

Simultaneous Triangulation-Simultaneous Diagonalization-Direct-sum Decompositions-Invariant Direct Sums-The Primary Decomposition Theorem. Sections 6.5, 6.6, 6.7, 6.8 of Chapter 6 in Prescribed Text book I

UNIT-III

Definitions of lattices, Modular lattices and distributive lattices. Chapter I of text book of II

UNIT-IV

Basic properties, Boolean polynomials, ideals, minimal forms of Boolean polynomials, Chapter 2 of text book II

Text Book I: Linear Algebra second edition By Kenneth Hoffman and Ray Kunze, Prentice-Hall of India Private Limited, New Delhi-110001, 2002

Text Book II: Applied Abstract Algebra by Rudolf Lidl and Gunter Pilz, Published by Springer verlag.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
II-SEMESTER
M201 ALGEBRA – II
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Fields: Extension Fields- The Transcendence of e – Roots of Polynomials- Construction with Straightedge and Compass. Chapter 5 sections 5.1 -5.4

UNIT-II

Fields: More about roots- The elements of Galois Theory- Solvability by Radicals- Galois Groups over the Rationals. Chapter 5 sections 5.5- 5.8

UNIT-III

Finite Fields- Wedderburn's Theorem on Finite Division Rings. Chapter 7 sections 7.1 , 7.2

UNIT-IV

A Theorem of Frobenius- Integral Quaternions and the Four-Square Theorem. Chapter 7 sections 7.3, 7.4

Prescribed Book: Topics in Algebra: I. N. Herstein , Second edition, John Wiley & Sons.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
II-SEMESTER
M202 REAL ANALYSIS-II
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Riemann-Stieltjes Integral: Definition and existence of the Riemann Stieltjes Integral, Properties of the Integral, Integration and Differentiation, the fundamental theorem of calculus – Integral of Vector- valued Functions, Rectifiable curves. (Chapter 6 of the text book)

UNIT-II

Sequences and Series of the Functions: Discussion on the Main Problem, Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation, Equicontinuous families of Functions, the Stone-Weierstrass Theorem. (Chapter 7 of the text book)

UNIT-III

Power Series: (A section in Chapter 8 of the text book)

Functions of Several Variables: Linear Transformations, Differentiation, The Contraction Principle, The Inverse Function theorem. (First Four sections of chapter 9 of the text book)

UNIT-IV

Functions of several variables Continued: The Implicit Function theorem, The Rank theorem, Determinates, Derivatives of Higher Order, Differentiation of Integrals. (5th to 9th sections of Chapter 9 of the text book)

TEXT BOOK: Principles of Mathematical Analysis by Walter Rudin, International Student Edition, 3rd Edition, 1985.

REFERENCE: Mathematical Analysis by Tom M. Apostol, Narosa Publishing House, 2nd Edition, 1985.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
II-SEMESTER
M203 TOPOLOGY II
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Separation: T_1 – space and Hausdorff spaces – Completely regular spaces and normal spaces – Urysohn’s lemma and the Tietze extension theorem – The Urysohn imbedding theorem – The Stone – Čech compactification. Chapter 5: Sections 26 to 30 Prescribed text book – 1.

UNIT-II

Connectedness: Connected spaces – The components of a space – Totally disconnected spaces – Locally connected spaces. Chapter 6: Sections 31 to 34 Prescribed text book – 1.

UNIT-III

Approximation: The Weierstrass approximation theorem – The Stone-Weierstrass theorems – Locally compact Hausdorff spaces – The extended Stone-Weierstrass theorems. Chapter 7: Sections 35 to 38 Prescribed text book – 1.

UNIT-IV

Topological Groups: Neighborhoods of a point in topological group-Isomorphism and local isomorphisms-Subgroups-Quotient groups–Homomorphisms. Chapter 31,33 of Prescribed text book 2.

Prescribed book: 1. Introduction to Topology by G.F.Simmons, Mc.Graw-Hill book company.
2. General Topology by Bourbaki, Wesley publishing company.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
II-SEMESTER
M204 COMPLEX ANALYSIS
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Elementary properties and examples of analytic functions: Power series- Analytic functions- Analytic functions as mappings, Möbius transformations. (§1, §2, §3 of chapter-III of prescribed text book)

UNIT-II

Complex Integration: Riemann- Stieltjes integrals- Power series representation of analytic functions- zeros of an analytic functions- The index of a closed curve. (§1, §2, §3 §4 of chapter-IV of prescribed text book)

UNIT-III

Cauchy’s theorem and integral formula- the homotopic version of Cauchy’s theorem and simple connectivity- Counting zeros; the open mapping theorem. (§5, §6, §7 of chapter-IV of prescribed text book)

UNIT-IV

Singularities: Classifications of singularities- Residues- The argument principle. (§1, §2, §3 of chapter-V of prescribed text book)

Prescribed text book: Functions of one complex variables by J.B.Conway : Second edition, Springer International student Edition, Narosa Publishing House, New Delhi.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
II-SEMESTER
M205 GRAPH THEORY AND CODING THEORY
(Non Core/CBCS, For AU Students)

UNIT-I:

Graphs, digraphs, network, multi graph, elementary results , structure based on connectivity, characterization, theorems on trees, tree distances, binary trees. Chapters 1, 2 and 3 of Text Book I

UNIT-II:

Eulerian graphs, Hamiltonian graphs, Spanning trees, Fundamental cycles, Minimal spanning trees, (Chapter 4 of text book I) Kruskal algorithm, Prims algorithm (8.5 of Text Book II)

UNIT-III:

Introduction to Coding Theory: Introduction, Basic assumptions, correcting and detecting codes, Information rate, The effects of error detection and correction, Finding the most likely code word transmitted, Some basic algebra, Weight and distance, Maximum likelihood decoding, Reliability of M L D. From Chapter 1 of Text Book III

UNIT-IV:

Error detecting codes, Error corer correcting codes; Linear codes: Linear codes, Two Important subspaces, Independence, Basis, Dimension, Matrices, Bases for $C=\langle S \rangle$ and C , Generating matrices and Encoding, Patity check matrices. Chapter 2 of Text Book III

TEXT BOOK I: Graph Theory applications By L.R.Foulds, Narosa publishing House, New Delhi

TEXT BOOK II: Discrete mathematical structures by Kolman and Busby and Sharon Ross
Prentice Hall of India-2000, (Third Edition)

TEXT BOOK III: Coding Theory by D. G. Hoffman, D. A. Lanonard, C. C. Lindroes

M205 GRAPH THEORY AND ADVANCED CODING THEORY (For affiliated P.G. Colleges)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:

Graphs, digraphs, network, multi graph, elementary results , structure based on connectivity, characterization, theorems on trees, tree distances, binary trees. Chapters 1, 2 and 3 of Text Book I

UNIT-II:

Eulerian graphs, Hamiltonian graphs, Spanning trees, Fundamental cycles, Minimal spanning trees. (Chapter 4 of text book I) Kruskal algorithm, Prims algorithm (8.5 of Text Book II)

UNIT-III:

Introduction to Coding Theory: Introduction, Basic assumptions, correcting and detecting codes, Information rate, The effects of error detection and correction, Finding the most likely code word transmitted, Some basic algebra, Weight and distance, Maximum likelihood decoding, Reliability of M L D, Error detecting codes, Error correcting codes. From Chapter 1 and first few sections of Chapter 2 of Text Book III.

UNIT-IV:

Linear codes: Linear codes, Two Important subspaces, Independence, Basis, Dimension, Matrices, Bases for $C=\langle S \rangle$ and C , Generating matrices and Encoding, Patity check matrices, Equivalent codes, Distance of a Linear code, Cosets, M L D for Linear codes, Reliability of Linear codes. Rest of Chapter 2 of Text Book III.

TEXT BOOK I: Graph Theory applications By L.R.Foulds, Narosa publishing House, New Delhi

TEXT BOOK II: Discrete mathematical structures by Kolman and Busby and Sharon Ross
Prentice Hall of India-2000, (Third Edition)

TEXT BOOK III: Coding Theory by D. G. Hoffman, D. A. Lanonard, C. C. Lindroes

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M301 FUNCTIONAL ANALYSIS (COMPULSORY)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Banach spaces: The definition and some examples, continuous linear transformation, The Hahn-Banach theorem, the natural imbedding of \mathbb{N} in \mathbb{N}^{**} , The open mapping theorem. Sections 46-50, Chapter 9.

UNIT-II

The conjugate of an operator, Hilbert spaces: The definition and some simple properties, orthogonal complements, orthonormal sets. Section 51, Chapter 9 and Sections 52-54, Chapter 10.

UNIT-III

(Self) Adjoint, Normal, Unitary Operators: The conjugate space H^* , the adjoint of an operator, Self-adjoint operators, Normal and Unitary operators, Projections. Sections 55-59, Chapter 10.

UNIT-IV

Finite-dimensional spectral theory: Matrices, determinants and the spectrum of an operator, the spectral theorem. A survey of the situation. Sections 60-63, Chapter 11.

Text Book: Introduction to Topology and Modern Analysis by G. F. Simmons, McGraw Hill Book Company. Inc-International student edition.

STREAM – A
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M302(1)-NUMBER THEORY- I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:- ARITHMETICAL FUNCTIONS AND DIRICHLET MULTIPLICATION:

Introduction- The Mobius function $\mu(n)$ – The Euler totient function $\phi(n)$ - A relation connecting ϕ and μ - A product formula for $\phi(n)$ - The Dirichlet product of arithmetical functions- Dirichlet inverses and the Mobius inversion formula- The Mangoldt function $\Lambda(n)$ - multiplicative functions- multiplicative functions and Dirichlet multiplication- The inverse of a completely multiplicative function-Liouville's function $\lambda(n)$ - The divisor functions $\sigma_\alpha(n)$. Chapter-2:- Articles 2.1 to 2.14

AVERAGES OF ARITHMETICAL FUNCTIONS: Introduction- The big oh notation. Asymptotic equality of functions- Euler's summation formula- Some elementary asymptotic formulas-The average order of $d(n)$ - The average order of the divisor functions $\sigma_\alpha(n)$ - The average order of $\phi(n)$. The partial sums of a Dirichlet product- Applications to $\mu(n)$ and $\Lambda(n)$ - Another identity for the partial sums of a Dirichlet product.

Chapter -3:- Articles 3.1 to 3.7

UNIT-II :- The partial sums of a Dirichlet product- Applications to $\mu(n)$ and $\Lambda(n)$ - Another identity for the partial sums of a Dirichlet product. **SOME ELEMENTARY THEOREMS ON THE DISTRIBUTION OF PRIME NUMBERS:**

Introduction- Chebyshev's functions $\psi(x)$ and $\vartheta(x)$ - Relations connecting $\vartheta(x)$ and $\pi(x)$ - Some equivalent forms of the prime number theorem-Inequalities for $\pi(n)$ and p_n - Shapiro's Tauberian theorem- Applications of Shapiro's theorem- An asymptotic formula for the partial sums $\sum_{p \leq x} (1/p)$ - The partial sums of the

Mobius function – The partial sums of the Mobius function. Chapter -3:- Articles 3.10 & 3.11 and Chapter-4:- Articles 4.1 to 4.9

UNIT-III :- CONGRUENCES: Definition and basic properties of congruences- Residue classes and complete residue systems- Linear congruences- Reduced residue systems and the Euler- Fermat theorem- Polynomial congruences modulo p . Lagrange's theorem- Applications of Lagrange's theorem- Simultaneous linear congruences. The Chinese remainder theorem- Applications of the Chinese remainder theorem- Polynomial congruences with prime power moduli. Chapter -5:- Articles 5.1 to 5.9

UNIT-IV :- FINITE ABELIAN GROUPS AND THEIR CHARACTERS:

Characters of finite abelian groups- The character group- The orthogonality relations- for characters- Dirichlet characters- Sums involving Dirichlet characters-The nonvanishing of $L(1, \chi)$ for real nonprincipal χ .

DIRICHLET'S THEOREM ON PRIMES IN ARITHMETIC PROGRESSIONS: Introduction- Dirichlet's theorem for primes of the form $4n-1$ and $4n+1$ - The plan of the proof of Dirichlet's theorem- Proof of Lemma 7.4- Proof of Lemma 7.5- Proof of Lemma 7.6- Proof of Lemma 7.7- Proof of Lemma 7.8- Distribution of primes in arithmetic progressions. Chapter 6:- Articles 6.5 to 6.10 and Chapter 7 :- 7.1 to 7.9

TEXT BOOK: Introduction to Analytic Number Theory- By T.M.APOSTOL-Springer Verlag-New York, Heidelberg-Berlin-1976.

STREAM – A
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M302(2) UNIVERSAL ALGEBRA-I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:-

Lattices: Definitions of Lattices – Isomorphism's of Lattices and Sub lattices- Distributive and Modular Lattices- Complete lattices- Equivalence relations- Algebraic lattices- Closure operators. (Sections 1, 2, 3,4,5, of Chapter-I of the prescribed text book)

UNIT-II:-

The Elements of Universal Algebra: Definition and examples of algebras- Isomorphic algebras and sub algebras – Algebraic lattices and sub universes – The irredundant Basis theorem. (Sections 1, 2, 3,4,, of Chapter-II of the prescribed text book)

UNIT-III:-

Congruences and Quotient algebras- Homomorphisms – The homomorphism and isomorphism theorems. (Sections 5, 6,, of Chapter-II of the prescribed text book)

UNIT-IV:-

Direct products- Factor congruences and Directly indecomposable algebras- Sub direct products- Subdirectly irreducible algebras and Simple algebras- Class operators- Varieties. (Sections 7, 8, 9,, of Chapter-II of the prescribed text book)

Prescribed Book: A course in Universal algebra- Stanley Burris, H.P. Sankappanavar, Springer-Verlag, New York- Heidelberg- Berlin.

STREAM – A
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER

M302(3) FUZZY SET THEORY AND APPLICATIONS

UNIT-I: From Classical(Crisp) sets to fuzzy sets:- Introduction-Crispsets: An overview-fuzzysset:Basic types-Fuzzy sets. Basic Concepts-Characteristics and significance of the paradigm shift(CH-1 of (I)). Fuzzysets versus Crisp sets-Additional Properties of a cuts-Representations of Fuzzysets-Extension principle for Fuzzysets(CH-2 of (I)).

UNIT-II: Operations on Fuzzysets - Types of Operations - Fuzzy Compliments - Fuzzy Inter sections: t-norms - Fuzzy unions; t-Conorms - Combinations of operations - Agreegation Operations(CH-3 of(I)).

UNIT-III: Fuzzy Arithmetic -Fuzzy Numbers - Linguistic variables - Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers - Lattice of fuzzy numbers - Fuzzy equations(CH-4 of (I)).

UNIT-IV: Fuzzy Relations - Crisp versus fuzzy relations - Projections and Cylindric Extensions - Binary Fuzzy Relations - Binary Relations and Singleset - Fuzzy Equivalence Relations - Binary Relations on a single set - Fuzzy Compatibility Relations - Fuzzy Ordering Relations - Fuzzy Morphisms - Sup - Compositions of Fuzzy Relations - Inf - Compositions of fuzzy Relations(CH-5 of (I)).

TEXT BOOK: G.J.KLIR and BOYUAN, "Fuzzy sets and Fuzzy Logic, Theory and Applications" Prentice - Hall of India Pvt. Ltd., New Delhi., 2001.

STREAM - B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.Sc. MATHEMATICS-III SEMESTER
M303(1) LATTICE THEORY-I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:-

Partially Ordered sets- Diagrams- Special subsets of a poset –length- lower and upper bounds- the minimum and maximum condition- the Jordan Dedekind chain conditions – Dimension functions.
(Sections 1 to 9 of chapter I of the prescribed text book)

UNIT-II:-

Algebras-lattices- the lattice theoretic duality principle- semilattices- lattices as posets-diagrams of lattices- semi lattices, ideals-bound elements of Lattices-atoms and dual atoms-complements, relative complements, semi complements-irreducible and prime elements of a lattice- the homomorphism of a lattice-axioms systems of lattices. (Sections 10 to 21 of chapter II of the prescribed text book)

UNIT-III:-

Complete lattices- complete sublattices of a complete lattice- conditionally complete lattices- lattices – compact elements, compactly generated lattices- subalgebra lattice of an algebra-closure operations- Galois connections, Dedekind cuts- partially ordered sets as topological spaces.
(Sections 22 to 29 of chapter III of the prescribed text book)

UNIT-IV:-

Distributive lattices-infinitely distributive and completely distributive lattices-modular lattices- characterization of modular and distributive lattices by their sublattices- distributive sublattices of modular lattices- the isomorphism theorem of modular lattices, covering conditions-meet representations in modular and distributive lattices- some special subclasses of the class of modular lattices-preliminary theorems – modular lattices of locally finite length- the valuation of a lattice, metric and quasi metric lattices- complemented modular lattices. (Sections 30 to 40 of Chapters IV and V of the prescribed text book)

Prescribed Text Book: Introduction to Lattice Theory, by Gabor Szasz, Academic Press, New York.

Book for reference: General Lattice Theory by G. Grätzer, Academic Press, New York.

STREAM – B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M303(2) OPERATIONS RESEARCH
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I: Linear Programming: The Simplex Method – Overall Idea of the Simplex Method – Development of the Simplex Method – Primal Simplex method – Dual Simplex Method – Special cases in Simplex Method Applications – Sensitivity Analysis. Sections 3.1 to 3.7 of the Chapter 3 in the Text Book

UNIT-II: Revised Simplex Method and Duality: Mathematical Foundations – Revised (Primal) Simplex Method – Definition of the Dual Problem – Solution to the Dual Problem – Economic Interpretation of the Dual Problem. Sections 4.1 to 4.3 of the Chapter 4 and sections 5.1 to 5.4 of Chapter 5 in the Text Book.

UNIT-III: Transportation Model and Net Works: Definitions and Applications of the Transportation – Solution of the Transportation Problem – The Assignment Model – The Transshipment Model – Network Definitions – Minimal Spanning Tree problem – Shortest – Route Problem. Sections 6.1 to 6.5 of the Chapter 6 and sections 8.1 to 8.3 of the Chapter 8 in the Text Book.

UNIT-IV: Network Models: - Maximal Flow Problem – Minimum Cost Capacitated Flow Problem

Decision Theory and Games:

Decisions Under Uncertainty – Game Theory – Optimal solution of Two-Person Zero-sum Games, Mixed strategies. Sections 8.4 to 8.6 of the Chapter 8 and sections 12.3, 12.4.1, 12.4.2 of the Chapter 12 in the Text Book.

Text Book: Operations Research, An Introduction: Hamdy A Taha, Maxwell Macmillan International Edition, New York, 1992.

STREAM – B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M303(3) MATHEMATICAL BIOLOGY
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:

Autonomous differential equations - Equilibrium solutions - Stability nature of equilibrium solutions, single species growth models involving exponential, logistic and Gompertz growths. Harvest models – bifurcations and break points. (Sections 1 and 2 of the Text Book)

UNIT-II:

Lotka Volterra predator – prey model – phase plane analysis, General predator prey systems – equilibrium solutions – classification of equilibria – existence of cycles – Bendixson-Dulac's negative criterion – functional responses. (Sections 7 and 8 of the text book)

UNIT-III:

Global bifurcations in predator prey models – Freedman and Wolkowicz model - type IV functional response – Hopf bifurcation – Homoclinic orbits – Global bifurcations using Allee effect in prey – Competition models – Lotka – Volterra Competition model – exploitation competition models. (Sections 9 and 12 of the text book)

UNIT-IV:

Mutualism models – various types of mutualisms – cooperative systems – Harvest models and optimal control theory – open access fishery – sole owner fishery – Pontryagin's maximum principle – Economic interpretation of Hamiltonian and adjoint variable. (Sections 13 and 14 of the text book)

Text book: Mark Kot, 2001, Elements of Mathematical Ecology, Cambridge University Press.

Reference: Nisbet and Gurney, 1982, Modelling Fluctuating Populations, John Wiley & Sons.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M304(1) COMMUTATIVE ALGEBRA- I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Rings and ring homomorphism, ideals, quotient rings, zero divisors, Nilpotent elements, units, prime ideals and Maximal ideals, nil radical and Jacobson radical, operations on ideals, Extensions and contractions.

UNIT-II

Modules and module homomorphisms, Sub modules and quotient modules, operations on submodules, Direct sum and product, finitely generated modules, exact sequences, Tensor product of modules, Restriction and extension of scalars, Exactness properties of the tensor product, algebras, tensor product of algebras.

UNIT-III

Local Properties, Extended and contracted ideals in rings of fractions.

UNIT-IV

Primary decompositions

Content and extent of chapters 1 to 4 of the prescribed text book.

Prescribed text book: Introduction to commutative algebra, By M.F. ATIYAH and I.G. MACDONALD, Addison-Wesley publishing Company, London.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M304(2) SEMI GROUPS- I
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Basic definition, monogenic semigroups, ordered sets, semilattices and lattices, binary relations, equivalences and congruences.

UNIT-II

Free semigroups, Ideals and Rees' congruences, Lattices of equivalences and congruences. Green's equivalences, the structure of D-classes, regular semigroups.

UNIT-III

Simple and 0-simple semigroups, Principal factors, Rees' theorem, Primitive idempotents.

UNIT-IV

Congruences on completely 0-simple semi groups, The lattice of congruences on a completely 0-simple semigroup, Finite congruence free semigroups.

Contents of the syllabus-Chapters 1,2 and 3 of the text book.

Text Book: An introduction to semi group theory by J.M. Howie, 1976, Academic press, New York.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER
M304(3) ADVANCED GRAPH THEORY

UNIT-I

Matching and Augmenting paths; The marriage problem; The personnel assignment problem; The optimal Assignment problem. (Chapter 4 of the Text Book)

UNIT-II

Plane and planar graphs; Euler's formula, The platonic bodies, kurtowski's Theorem, Non-Hamiltonian plane graphs, The dual of a plane graph. (Chapter 5 of the Text Book)

UNIT-III

Vertex colouring; vertex colouring Algorithms; Critical graphs; cliques; Edge colouring; Map colouring. (Chapter 6 of the Text Book)

UNIT-IV

Definitions; Indegree and outdegree; Tournaments; Traffic flow.(Chapter 7 of the Text Book)

Text Book: A first look at GRAPH THEORY; John Clark & Derek Allan Holton, Allied Publishers Limited 1995.

**ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
III-SEMESTER**

**M305 LINEAR ALGEBRA AND NUMBER THEORY (Non Core/CBCS/For A.U. Students ONLY)
M305 COMPLEX ANALYSIS II (For Affiliated Colleges ONLY)
(Restructured/w.e.f. 2014-15 admitted batch)**

M305 LINEAR ALGEBRA AND NUMBER THEORY (Non Core/CBCS/For A.U. Students ONLY)

UNIT-I: Vector Spaces, Subspaces, Bases and dimension, Coordinates

Articles 2.1 to 2.4 of CHAPTER 1 OF TEXT BOOK I

UNIT-II: Linear Transformations, The Algebra of Linear Transformations, Isomorphism, Representation of Linear Transformation by Matrices. Articles 3.1 to 3.4

UNIT-III: Divisibility, Greatest Common Divisor, Prime numbers, The Fundamental Theorem of Arithmetic, The Euclidean Algorithm, Chapter 1 of Text book II

UNIT-IV: Definition and Basic Properties of Congruences, Residue classes and Complete Residue Systems, Linear Congruences, Reduced Residue Systems, and the Euler Fermat Theorem Chapter 5 Of Text book II

TEXT BOOK I: LINEAR ALGEBRA by KENNETH HOFFMAN , RAY KUNZ
(Second Edition) Prentice Hall of India.

TEXT BOOK II: Introduction to Analytic Number Theory by TOM M APOSTOL ,
Springer Verlag, New York

M305 COMPLEX ANALYSIS II (For Affiliated Colleges ONLY)

UNIT-I

The maximum modulus theorem: The maximum principle-Schwarz's lemma- Convex functions and Hadamard's three circles theorem- Phragmen- Lindelof theorem. (Sections 1,2,3,4 of Chapter-VI of the prescribed text book)

UNIT-II

Compactness and convergence in the Spaces of Analytic Functions: The space of continuous functions $C(G, \Omega)$ - Spaces of Analytic functions- Spaces of meromorphic functions- The Riemann Mapping Theorem- Weierstrass Factorization theorem- Factorization of sine functions. (Sections 1, 2, 3,4,5,6 of Chapter-VII of the prescribed text book)

UNIT-III

Runge's Theorem: Runge's Theorem-Simple connectedness- Mittag-Leffler's Theorem, Analytic Continuation and Riemann Surfaces, Schwarz Reflection Principle- Analytic Continuation Along A Path- Mondromy Theorem. (Sections 1, 2, 3 of Chapter- VIII, Sections 1, 2, 3 of Chapter-IX of the prescribed text book)

UNIT-IV

Harmonic Functions: Basic properties of Harmonic functions- Harmonic functions on a disk. Jensen's formula, The genus and the order of an entire function Hadamard's factorization theorem. (Sections 1, 2, of Chapter- X and Sections 1, 2, 3 of Chapter- XI of the prescribed text book)

Prescribed text book: Functions of one complex variables by J. B. Conway: Second edition, Springer International Student Edition. Narosa Publishing House, NEW DELHI.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M401 MEASURE and INTEGRATION
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Lebesgue measure: Introduction, Outer measure, measurable sets and Lebesgue measure, A nonmeasurable set, measurable functions, Littlewood's three principles. Chapter 3 of the text book

UNIT-II

The Lebesgue Integral: The Riemann integral, The Lebesgue integral of a bounded function over a set of finite measure, the integral of nonnegative function, the general Lebesgue integral, convergences in measure. Chapter 4 of the text book

UNIT-III

Differentiation and integration: Differentiation of monotone functions, Functions of bounded variation and differentiation of an integral, Absolute continuity, and convex functions. Chapter 5 of the text book

UNIT-IV

The classical Banach spaces: The L^p -spaces, The Minkowski and Holder inequalities, convergence and completeness, approximation in L^p , Bounded linear functionals on the L^p spaces. Chapter 6 of the text book

TEXT BOOK: Real Analysis by H. L. Royden, Macmillan Publishing Co. Inc. 3rd Edition, New York, 1988.

STREAM – A
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M402(1) NUMBER THEORY- II
(PRE-REQUISITE NUMBER THEORY – I)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:- PERIODIC ARITHMETICAL FUNCTIONS AND GAUSS SUMS: Functions periodic modulo k - Existence of finite Fourier series for periodic arithmetical functions- Ramanujan's sum and generalizations- Multiplicative properties of the sums $s_k(n)$ - Gauss sums associated with Dirichlet characters-Dirichlet characters with nonvanishing Gauss sums.

QUADRATIC RESIDUES AND THE QUADRATIC RECIPROCITY LAW:

Quadratic residues- Legendre's symbol and its properties- Evaluation of $(-1/p)$ and $(2/p)$ - Gauss Lemma-The quadratic reciprocity law-Applications of the reciprocity law- The Jacobi symbol- Applications to Diophantine equations- Gauss sums and the quadratic reciprocity law. Chapter 8:- Articles 8.1 to 8.6 and Chapter 9:- Articles 9.1 to 9.9

UNIT-II:- PRIMITIVE ROOTS: The exponent of a number mod m . Primitive roots- Primitive roots and reduced residue systems-The nonexistence of primitive roots mod 2^α for $\alpha \geq 3$ - The existence of primitive roots mod p for odd primes p . Primitive roots and quadratic residues- The existence of primitive roots mod p^α - The existence of primitive roots mod $2p^\alpha$ - The nonexistence of primitive roots in the remaining cases- The number of primitive roots mod m . The index calculus- Primitive roots and Dirichlet characters-Real-valued Dirichlet characters mod p^α - Primitive Dirichlet characters mod p^α .

UNIT-III :- DIRICHLET SERIES AND EULER PRODUCTS: Chapter- 11:- Articles 11.1 to 11.7. The half- plane of absolute convergence of a Dirichlet series, The function defined by Dirichlet series, Multiplication of Dirichlet series, Euler Products, The half-plane of convergence of a Dirichlet series, Analytic properties of Dirichlet series, Dirichlet series with non negative coefficients.

UNIT-IV :- Chapter- 12:- Articles 12.1 to 12.8. Properties of the gamma function, Integral representation for the Hurwitz zeta function, A contour integral representation for the Hurwitz zeta function, The analytic continuation of the Hurwitz zeta function, Analytic continuation of $\zeta(s)$, $L(s, \chi)$, Hurwitz's formula for $\zeta(s, a)$, The functional equation for Riemann zeta function.

TEXT BOOK: Introduction to Analytic Number Theory- By T.M.APOSTOL- Springer Verlag-New York, Heidelberg-Berlin-1976.

STREAM – A
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M402(2) UNIVERSAL ALGEBRA-II
(PRE-REQUISITE: UNIVERSAL ALGEBRA-I)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:

Terms, Term Algebras and Free algebras- Identities , Free algebras and Birkhoff's theorem- Mal'cev conditions- The Centre of an algebra. (Sections 10, 11, 12, 13, of Chapter-II of the prescribed text book)

UNIT-II:

Boolean Algebras- Boolean rings – Filters and ideals- Stone identity. (Sections 1, 2, 3, 4, of Chapter-IV of the prescribed text book)

UNIT-III:

Boolean Powers- Ultra products and congruence- Distributive varieties- Primal algebras- Boolean Products. (Sections 5, 6, 7, 8, of Chapter-IV of the prescribed text book)

UNIT-IV:

Discriminator varieties – Quasi primal algebras – Functionally complete algebras – skew-free algebras- Semi simple varieties – Directly represent able varieties. (Sections 9, 10, 11, 12, 13, of Chapter-IV of the prescribed text book)

Prescribed Book: A course in Universal algebra- Stanley Burris, H.P. Sankappanavar, Springer-Verlag, New York- Heidelberg- Berlin.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M402(3) OPERATOR THEORY
(Restructured/W.E.F. from 2014-15 admitted batch)

UNIT-I

Banach fixed point theorem- application of Banach's theorem to linear equations-application of Banach's theorem to differential equations-application of Banach's theorem to integral equations. Chapter 5 of the text book

UNIT-II

Approximation in normed spaces-Uniqueness, strict convexity-uniform approximation-Chebyshev polynomials – Splines. Sections 6.1 to 6.4 and 6.6 of Chapter 6 of the text book.

UNIT-III

Spectral theory in finite dimensional Normed spaces-basic concepts-spectral properties of bounded linear operators-further properties of Resolvent and spectrum-use of complex analysis in spectral theory. Sections 7.1 to 7.5 of Chapter 7 of the text book

UNIT-IV

Compact linear operator of normed spaces-Further properties of compact linear operators-Spectral properties of compact linear operators on normed spaces-further spectral properties of compact linear operators. Sections 8.1 to 8.4 of Chapter 8 of the text book.

Text book: Introductory Functional Analysis and Applications by Kreyszig, John Wiley and Sons, Delhi, 2001.

STREAM B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M403(1) LATTICE THEORY-II
(PRE-REQUISITE: LATTICE THEORY-I)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I

Boolean algebras, De Morgan formulae- Complete Boolean algebras- Boolean algebras and Boolean rings- The algebra of relations- The lattice of propositions- Valuations of Boolean algebras. (Sections 42 to 47 of chapters VI of the prescribed text book)

UNIT-II

Birkhoff lattices- Semimodular lattices- Equivalence lattices- Linear dependence- Complemented semimodular lattices. (Sections 48 to 52 of chapters VII of the prescribed text book)

UNIT-III

Ideals and dual ideals, Ideal chains- Ideal lattices- Distributive lattices and rings of sets. (Sections 53 to 55 of chapters VIII of the prescribed text book)

UNIT-IV

Congruence relation of an algebra- Permutable equivalence relations- The Schreier refinement theorem in arbitrary algebras- Congruence relations of lattices- Minimal congruence relations of some subsets of a distributive lattice- The connection between ideals and congruence relations of a lattice. (Sections 56 to 61 of chapters IX of the prescribed text book)

Prescribed text book: Introduction to Lattice Theory by Gabor Szasz, Academic Press, New York.
Books for reference: General Lattice Theory by G. Gratzner, Academic Press, New York.

STREAM – B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M403(2) Formal Languages and Automata Theory
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:

Sets, relations, strings, alphabets, languages, inductive proofs, finite state systems, nondeterministic finite automata, finite automata e-moves, regular expressions, 2 way finite automata, finite automata with output, applications of finite automata (Chaps. 1 and 2, pgs. 1-54.).

UNIT-II:

The pumping lemma for regular sets. Closure properties, decision algorithms, The Myhill-Nerode theorem, minimization of finite automata. (Chap. 3, pgs. 55-76.)

UNIT-III:

Context free grammars, derivation trees, simplification of CF grammars, Chomsky normal form, Greibach normal form, existence of inherently ambiguous CF languages. (Chaps 4, pgs. 77-106)

UNIT-III: Push down automata, the pumping lemma, closure properties, decision algorithms for CFL's. (Chaps. 5 and 6, pgs. 107-145.)

Content and scope as in Hopcroft and Ullman, Chaps. 1-6, Pages 1-145.

Prescribed text book: Hopcroft J. and Ullman J.D., Introduction to Automata Theory, Languages and Computation.

STREAM – B
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M403(3) BANACH ALGEBRAS
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:

General preliminaries on Banach Algebras – The definition and examples – Regular and singular elements – Topological divisors of Zero – The spectrum – The formula for the spectral radius – The radical and the semi – simplicity.

UNIT-II:

The structure of commutative Banach Algebras - The Gelfand mapping - Applications of the formula $r(x) = \lim_{n \rightarrow \infty} \|x^n\|^{1/n}$ – Involutions in Banach Algebras – The Gelfand – Neumark theorem.

UNIT-III:

Some special commutative Banach Algebras - Ideals in $C(X)$ and the Banach – Stone theorem - The stone – Chech compactification – commutative C^* - algebras.

UNIT-IV:

Fixed point theorems and some applications to analysis – Brouwer’s and Schauder’s fixed point theorems (without proofs) Picard’s theorem – Continuous curves – The Hahn – Mazurkiewicz theorem (without proof). Boolean rings – The stone representation theorem.

Text Book: Introduction to Topology and Modern Analysis – By G.F. Simmons – International Student edition – McGraw – Hill Kogakusha Ltd.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M404(1) COMMUTATIVE ALGEBRA-II
(PRE-REQUISITE: COMMUTATIVE ALGEBRA-I)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I: Integral dependence, the going-up theorem-Integrally closed integral domains, the going-down theorem, valuation rings.

UNIT-II: Chain Conditions

UNIT-III: Noetherian rings- Primary decomposition of Noetherian rings, Artin rings

UNIT-IV: Discrete valuation rings, Dedekind domains, Fractional ideals.

Content and extent of Chapters 5 to 9 of the prescribed text book.

Prescribed Text Book : Introduction to commutative algebra by M.F.Atiya and I.G. Macdonald, Addison-Wesley Publishing Company, London.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M404(2) SEMI GROUPS-II
(PRE-REQUISITE SEMIGROUPS – I)
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I: Union of Groups, Semi lattices of groups, bands, free bands, varieties of bands.

UNIT-II: Introduction to inverse semi groups, preliminaries, the natural partial order on an inverse semi group, fundamental inverse semi groups, anti-uniform semilattices.

UNIT-III: Bi-simple inverse semi groups, simple inverse semi-groups, representation of inverse semigroups.

UNIT-IV: Orthodox semigroups, basic properties, the analogue of the Munn semi-group, uniform and anti-uniform bands, the structure of orthodox semi groups.

Text Book: An introduction to semigroup theory by J.M.Howie, 1976, Academic press, New York.

STREAM – C
ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M404(3) NONLINEAR FUNCTIONAL ANALYSIS
(Restructured/w.e.f. 2014-15 admitted batch)

UNIT-I:-

Various forms of continuity- Geometry in normed spaces and duality mapping, Nemytskii, Hammerstein and Urysohn operators. Chapter 1 of the textbook

UNIT-II:-

Gateaux and Frechet derivative, Properties of derivative, Taylor's theorem, Inverse function theorem and Implicit function theorem, Sub differential of convex functions. Chapter 2 of the text book

UNIT-III:-

Banach's contraction principle and its generalization, Nonexpansive mappings, Fixed point theorems of Brouwer and Schauder. Sections 4.1 to 4.3 of Chapter 4 of the text book.

UNIT-IV:-

Fixed point theorems for multifunctions, common fixed point theorems, Sequences of contractions, generalized contractions and fixed points. Sections 4.4 to 4.6 of Chapter 4 of the textbook.

Prescribed Book: Some topics in Nonlinear functional analysis by Mohan C. Joshi and Ramendra k. Bose, Wiley Eastern limited- Hyderabad, 1985.

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER
M405 PARTIAL DIFFERENTIAL EQUATIONS (COMPULSORY)

UNIT-I:

First Order P.D.E. : Curves and Surfaces – Genesis of First Order P.D.E. – Classification of Integrals – Linear equations of the First Order - Pfaffian Differential Equations – Compatible Systems – Charpit's Method Jacobi's Method - Integral Surfaces Through a Given Curve.
Chapter 1 – sections 1.1 – 1.9

UNIT-II:

Second Order P.D.E. : Genesis of Second Order P.D.E. – Classification of Second Order P.D.E. – One Dimensional Wave equation: Vibrations of an Infinite String – Vibrations of Semi infinite String Vibrations of a String of Finite Length – Riemann's Method – Vibrations of a String of Finite Length(Method of Separation of Variables). Chapter 2 – section 2.1 – 2.3.

UNIT-III:

Laplace's Equation : Boundary value Problems- Maximum and Minimum Principles- The Cauchy Problem – The Dirichlet Problem for the Upper Half Plane – The Neumann Problem for the Upper Half Plane – Dirichlet Problem for a Circle – The Dirichlet Exterior Problem for a Circle- The Neumann Problem for a Circle – The Dirichlet Problem for a Rectangle- Harnack's Theorem Laplace's Equation – Green 's Function – The Dirichlet Problem for a Half Plane – The Dirichlet problem for a Circle. Chapter 2 – section 2.4

UNIT-IV:

Heat Conduction Problem : Heat Conduction – Infinite Rod Case - Heat Conduction –Finite Rod Case- Duhamel's Principle –Wave Equation –Heat Conduction Equation – Quasi Linear Equations – Non Linear First Order P.D.E. Chapter 2 – sections 2.5, 2.6 and Chapter 1 –sections 1.10 , 1.11.

Text book: T. Amarnath, An Elementary Course in Partial differential equations, Second Edition, Narosa Publishing House .