ANDHRA UNIVERSITY

M. A. /M. Sc. Mathematics Degree Examinations

First Semester

Real Analysis - I

(**For the academic year 2020- 21 only**)

 Syllabus

**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)

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

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NOTE: UNIT-IV is for assignment only and not included in the end-semester examination.

**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. Apostel, Narosa Publishing House, 2nd Edition, 1985.

ANDHRA UNIVERSITY

M. A. /M. Sc. Mathematics Degree Examinations

First Semester

Topology - I

(**For the academic year 2020- 21 only**)

 Syllabus

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, R) and C(X, C).

(Chapter 2: Sections 14,15 and Chapter 3: 16 to 20).

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

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NOTE: UNIT-IV is for assignment only and not included in the end-semester examination.

UNIT-IV

Compactness: Compact spaces – Product of Spaces – Tychonoff’s theorem and locally Compact

spaces – Compactness for metric spaces – Ascolis theorem. (Chapter 4: Sections 21 to 25).

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

ANDHRA UNIVERSITY

M. A. /M. Sc. Mathematics Degree Examinations

First Semester

Differential Equations

(**For the academic year 2020- 21 only**)

Syllabus

**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, Vibrations in mechanical systems.

(Chapter 3, Sections 14-20 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, Regular Sturm-Liouville problems. (Chapter 4, Sections 22-24 and Appendix A of prescribed text book.)

**UNIT-III**

**Laplace transforms:** Introduction, A few remarks on the theory, Applications to differential equations, Derivatives and integrals of Laplace transforms, Convolutions and Abel’s mechanical problem. (Chapter 10, Sections 50 to 54 of the prescribed text book.)

**Text book:** George F. Simmons, Differential Equations, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1994

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**Note: UNIT – IV is for assignment only and not included in the semester end examination.**

**UNIT-IV**

**Systems of first order equations:** Generalremarks on systems**,** Linear systems - Homogeneous linear systems with constant coefficients – Nonlinear Systems – Volterra’s prey-predator equations.

(Chapter 7, Sections 36-39 of prescribed text book.)

**Existence and Uniqueness of solutions** : The method of successive approximations - Picard’s theorem - Some examples. (Chapter 11, Sections 55-56 of prescribed text book.)

**Text book:** George F. Simmons, Differential Equations, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1994.

ANDHRA UNIVERSITY

M. A. /M. Sc. Mathematics Degree Examinations

First Semester

Linear Algebra

(**For the academic year 2020- 21 only**)

Syllabus

**Unit - I**

Introduction, Characteristic Values, Annihilating Polynomials, Invariant Subspaces, Simultaneous Triangulation; Simultaneous Diagonalization. **(Sections 6.1 - 6.5 of Chapter 6 in the Prescribed Text Book**)

**Unit - II**

Direct-Sum Decompositions, Invariant Direct Sums, The Primary Decomposition Theorem.

Cyclic Subspaces and Annihilators, Cyclic Decompositions and Rational form.

**(Sections 6.6 - 6.8 of Chapter 6 and sections 7.1 - 7.2 of Chapter 7 in the Prescribed Text Book)**

**Unit - III**

The Jordan Form, Computation of Invariant Factors, Summary; Semi-Simple Operators

**(Sections 7.3 - 7.5 of Chapter 7 in the Prescribed Text Book)**

**Prescribed Book**: Linear Algebra by Kenneth Hoffman and Ray Kunze, Prentice- Hall India Pvt. Ltd, 2nd Edition, New Delhi.

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**Note: UNIT – IV is for assignment only and not included in the semester end examination.**

**Unit - IV**

Bilinear Forms, Symmetric Bilinear Forms, Skew-Symmetric Bilinear Forms, Groups Preserving Bilinear Forms. **(Sections 10.1 - 10.4 of Chapter 10 in the Prescribed Text Book)**

**Prescribed Book**: Linear Algebra by Kenneth Hoffman and Ray Kunze, Prentice- Hall India Pvt. Ltd, 2nd Edition, New Delhi.

ANDHRA UNIVERSITY

M. A. /M. Sc. Mathematics Degree Examinations

First Semester

 Algebra - I

(**For the academic year 2020- 21 only**)

Syllabus

**UNIT I:**

**Normal subgroups and permutation groups**: Normal Subgroups: Normal subgroups and Quotient groups - Isomorphism theorems – Auto morphisms -Conjugacy and G-Sets- Cyclic Decomposition - Alternating group An – Simplicity of An.

Chapters 5 and 7

**UNIT II:**

**Structure theorems of groups**: Direct Products - finitely generated abelian groups - Invariants of a finite abelian group - Sylow theorems - Groups of orders p2, pq.

Chapter 8.

**UNIT III:**

**Ideals and homomorphisms**: Ideals-Homomorphisms-Sum and direct sum of ideals-Maximal and Prime Ideals.

Chapter10- sections10.1-10.4.

**Prescribed Book:** Basic Abstract Algebra: P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, Second edition, Cambridge University Press, printed and bound in India at Replika Press Pvt. Ltd., 2001.

**Reference Books:**

1. Topics in Algebra : [I. N. Herstein](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22I.N.Herstein%22), 2nd Edition, John Wiley &Sons
2. Algebra : Thomas W. Hungerford, Springer
3. Algebra : Serge Lang, Revised Third Edition, Springer

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**Note: UNIT – IV is for assignment only and not included in the semester end examination.**

**UNIT IV:**

**Syllabus for II Mid semester Examination:**

**Ideals and homomorphisms**: Nilpotent and Nil Ideals-Zorn’s Lemma-**Unique factorization domains and Euclidean domains**: unique factorization domains- Principal ideal domains- Euclidean domains- Polynomial rings over UFD

Chapter10-sections 10.5-10.6 and Chapter 11.

**Prescribed Book:** Basic Abstract Algebra: P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, Second edition, Cambridge University Press, printed and bound in India at Replika Press Pvt. Ltd., 2001.

**Reference Books:**

1. Topics in Algebra : [I. N. Herstein](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22I.N.Herstein%22), 2nd Edition, John Wiley &Sons
2. Algebra : Thomas W. Hungerford, Springer
3. Algebra : Serge Lang, Revised Third Edition, Springer
4. Modern Algebra: [QaziZameeruddin](http://www.vikaspublishing.com/author-details/qazi-zameeruddin/3271)&[Surjeet Singh](http://www.vikaspublishing.com/author-details/surjeet-singh/3346) , Eighth Edition, Vikas Publications