



ANDHRA UNIVERSITY TRANS-DISCIPLINARY RESEARCH HUB

TOPOLOGY

UNIT - I :

Convergence : Sequences and Nets - Filterbases in Spaces - Convergence Properties of Filterbases - Closure in terms of Filterbases - Continuity; Convergence in Cartesian Products - Adequacy of Sequences - Maximal Filterbases (Chapter X of the Prescribed Text Book).

UNIT – II :

Compactness : Compact Spaces – Special Properties of Compact Spaces – Countable Compactness - Compactness in Metric Spaces – Perfect Maps – Local Compactness - σ - Compact Spaces – Compactification – k - Spaces – Bair Spaces; Category (Chapter XI of the Prescribed Text Book).

UNIT – III :

Function Spaces : The Compact - open Topology – Continuity of Composition; the Evaluation Map – Cartesian Products – Application to Identification Topologies – Basis for Z^Y – Compact Subsets of Z^Y – Sequential Convergence in the c -Topology – Metric Topologies; Relation to the c -Topology – Pointwise Convergence – Comparison of Topologies in Z^Y (Chapter XII of the Prescribed Text Book).

UNIT – IV :

Complete Spaces : Cauchy Sequences – Complete Metrics and Complete Spaces – Cauchy Filterbases; Total Boundedness – Baire's Theorem for Complete Metric Spaces – Extension of Uniformly Continues Maps – Completion of a Metric Space – Fixed- Point Theorem for Complete Spaces – Complete Subspaces of Complete Spaces – Complete Gauge Structures (Chapter XIV of the Prescribed Text Book).

Prescribed Text Book : James Dugundji, Universal Book Stall, New Delhi.

Reference Text Books : 1. John L Kelly, General Topology, D. Van Nostrand Company, Inc.

120 Alexandar St Princeton, New Jersey. 24 West 40th Street,
New York 18, New York.

2. Bourbaki, General Topology, Addison – Wesley Publishing
Company, London.



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Advanced topics in Ordinary Differential Equations

Unit 1: Analysis and Methods of Nonlinear Differential equations - Existence theorem - Extremal solutions - Upper and Lower solutions- Monotone Iterative method and method of quasi-linearisation - Bihari inequality-Variation of parameters

Unit 2: Boundary value problems-Sturm-Liouville problem-Green's function-Application of Boundary Value Problems-Picard's theorem

Unit 3: Stability of Linear and Nonlinear systems-Elementary critical points-System of Equations with constant coefficients-Linear equation with constant coefficients-Lyapunov Stability

Unit 4: Stability of Quasi linear systems-Second order linear differential equations- Equations with deviating arguments-Equations with constant delay - Equations with piecewise constant delay - A few other types of Delay equations

Chapters 6,7,9,11 of the Text Book

Text Book: S.G. Deo, V. Lakshmikantham and V. Raghavendra, Text book of Ordinary Differential Equations, Tata McGraw-Hill Publishing Company Limited, New Delhi.



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Topics in Number Theory

Unit-I

Divisibility Theory in the Integers: The Divisibility Algorithm, The Greatest Common Divisor, The Euclidean Algorithm, The Diophantine Equation $ax + by = c$.

Primes and Their Distribution: The Fundamental theorem of arithmetic, The sieve of Eratosthenes, The Goldbach conjecture.

(Sections 2.1 to 2.4 of Chapter-2 and Sections 3.1 to 3.3 of Chapter-3 in the prescribed text book)

Unit-II

The theory of Congruences: Karl Friedrich Gauss, Basic properties of Congruence, special divisibility tests, Linear congruences.

Fermats theorem: Pierre de Fermat, fermat factorization method, the little theorem, Wilson's theorem.

(Section 4.1 to 4.4 of Chapter-4 and Section 5.1 to 5.4 of Chapter-5 in the prescribed text book)

Unit-III

Number-theoretic functions: The functions τ and σ , The Mobius Inversion formula, The greatest Integer function.

Perfect numbers: The search for Perfect numbers, Mersenne primes, Fermat numbers.

(Section 6.1 to 6.3 of Chapter-6 and Section 10.1 to 10.3 of Chapter 10 in the prescribed text book)

Unit-IV

Fibonacci numbers and Continued fractions: The Fibonacci sequence,

Certain identities involving Fibonacci numbers, Finite Continued fractions, Infinite Continued fractions, Pell's equation.

(Section 13.1 to 13.5 of Chapter-13 in the prescribed text book)

Prescribed Text book: Elementary Number Theory, Second Edition by David M. Burton

References:

1. An introduction to the theory of numbers, Fifth edition by Ivan Niven, Herberts Zuckerman and Hugh L. Montgomery,
2. Number Theory by George E. Andrews.