

**Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and
Commerce, Baramati**

Autonomous

Course Structure for B.Sc.(Computer Science) Mathematics

F. Y. B. Sc.(Computer Science) Mathematics

Semester	Paper Code	Title of Paper	No. of Credits
I	CSMT1101	Graph Theory	2
	CSMT1102	Algebra	2
	CSMT1103	Mathematics Practical based on CSMT1101 & CSMT1102	2
II	CSMT1201	Discrete Mathematics	2
	CSMT1202	Calculus	2
	CSMT1203	Mathematics Practical based on CSMT1201 & CSMT1202	2

S. Y. B. Sc.(Computer Science) Mathematics

Semester	Paper Code	Title of Paper	No. of Credits
III	CSMT2301	Linear Algebra	3
	CSMT2302	Numerical Analysis	3
	CSMT2303	Mathematics Practical I	2
IV	CSMT2401	Computational Geometry	3
	CSMT2402	Operations Research	3
	CSMT2403	Mathematics Practical II	2

**SYLLABUS (CBCS) FOR F. Y. B. Sc.(COMPUTER SCIENCE)
MATHEMATICS
(w.e.f. June, 2019)**

Academic Year 2019-2020

Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Paper Code: CSMT1101

Paper : I Title of Paper :Graph Theory
Credit : 2 No. of lectures: 36

A) Learning Objectives:

- To introduce graphs, their types and properties
- To understand applications of graph theory in Computer science
- To build the necessary skill set and analytical abilities for developing computer based solutions using mathematical concepts

B) Learning Outcome:

Understanding of algorithms and applications to computer science

TOPICS/CONTENTS:

Unit 01: Graphs (6lectures)

- 1.1 Definition,Elementary terminologies and results,Graph as Models.
- 1.2 Special types of graphs.
- 1.3 Isomorphism.
- 1.4 Adjacency and incidence Matrix of a graph.
- 1.5 Application to Computer Science.

Unit 02: Operations on Graphs (4lectures)

- 2.1 Subgraphs,induced subgraphs,Vertex deletion Edge deletion .
- 2.2 Complement of a graph and self - complementary graphs.
- 2.3 Fusion of vertices.
- 2.4 Application to Computer Science

Unit 03: Connected Graphs (9lectures)

- 3.1 Walk,Trail,Path,Cycle: Definitions and elementary properties.

- 3.2 Connected Graphs: Definition and properties.
- 3.3 Distance between two vertices, Eccentricity, Centre, Radius and Diameter of a graph.
- 3.4 Isthmus, Cutvertex : Definition and properties.
- 3.5 Cutset, Edge-connectivity, Vertex-connectivity.
- 3.6 Weighted Graph and Dijkstra's Algorithm.
- 3.7 Application to Computer Science.

Unit 04: Eulerian and Hamiltonian Graphs (5lectures)

- 4.1 Seven Bridge Problem, Eulerian Graph : Definition and Examples, N & S condition.
- 4.2 Fleury's Algorithm.
- 4.3 Hamiltonian Graphs : Definition and Examples, Necessary Condition.
- 4.4 Introduction of Chinese Postman Problem and Travelling Salesman Problem.
- 4.5 Application to Computer Science.

Unit 05: Trees (6lectures)

- 5.1 Definiton, Properties of trees.
- 5.2 Centre of a tree.
- 5.3 Binary Tree : Definiton and Properties.
- 5.4 Tree Traversal : Ordered rooted Tree, Preorder Traversal, Inorder Traversal and Postorder Traversal, Prefix Notation.
- 5.5 Spanning Tree : Definiton, Properties, Shortest Spanning Tree, Kruskal's Algorithm.
- 5.6 Application to Computer Science.

Unit 06: Directed Graphs (6lectures)

- 6.1 Definition, Examples, Elementary Terminologies and Properties.
- 6.2 Special Types of Digraphs.
- 6.3 Connectedness of Digraphs.
- 6.4 Network and Flows : Definition, Examples.
- 6.5 Application to Computer Science.

Reference Books:

1. Kenneth Rosen, Discrete Mathematics and It's Applications, Tata McGraw Hill.
 2. Narsingh Deo, Graph Theory with Application to Computer Science and Engineerng, Prentice Hall.
 3. John Clark and Derek Holtan , A First Look at Graph Theory, Allied Publishers.
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Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Paper Code: CSMT1102

Paper : II Title of Paper :Algebra
Credit : 2 No. of lectures: 36

A) Learning Objectives:

- To understand properties and operations on sets and functions
- To understand basic concepts of groups, integers, matrices

B) Learning Outcome:

Improves problem solving ability and understanding of different algebraic structures in Mathematics

TOPICS/CONTENTS:

Unit 01:Set and Functions (5 lectures)

- 1.1 Definition of set, operations on sets, power set, Cartesian product of sets.
- 1.2 Definition of Function, Domain, Codomain and the range of function, Injective, surjective and bijective functions, Composite function, invertible function.

Unit 02: Binary Operations and Groups (13 lectures)

- 2.1 Definition of binary operation,example,properties of binary operation.
- 2.2 Definition of Monoid,semigroup,example.
- 2.3 Definition of Group and example,subgroup,finite and infinite groups,Cyclic groups.
- 2.4 Applications to Computer Science.

Unit 03: Integers (9 lectures)

- 3.1 Well ordering principle.
- 3.2 First and Second Principle of Mathematical Induction ,Examples.
- 3.3 Division Algorithm (Without Proof)
- 3.4 Divisibility and its Properties, prime numbers.
- 3.5 Definition G.C.D and L.C.M ,Expressing G.C.D. of two integers as a linear combination of the two integers.
- 3.6 Euclidean Algorithm (Without Proof)
- 3.7 Relatively prime integers ,Euclid Lemma and its generalization.

3.8 Congruence relations and its properties, Residue Classes: Definition, Examples, addition and multiplication modulo n and composition tables.

3.9 Euler's and Fermat's Theorems.(Without Proof). Examples.

3.10 Applications to Computer Science.

Unit 04: Matrices and System of linear Equations

(9 lectures)

4.1 Revision: Elementary operations on matrices.

4.2 Echelon form of matrix.

4.3 System of linear Equations:

4.4 Gauss Elimination Method,
Gauss Jordan Elimination Method,
L.U. Decompositions Method.

4.5 Rank of matrix, Row rank, Column rank.

4.6 Applications to Computer Science.

Reference Books:

1. Discrete Mathematics Structure- Bernard Kolman, Robert Busby, Sharon Culter Ross, Nadeem-ur-Rehman , Pearson Education, 5th Edition.
2. Elements of Discrete Mathematics – C. L. Liu, Tata McGraw Hill.
3. J. B. Fraleigh, A. First Course in Abstract Algebra, 7th Edition, Pearson
4. H. Anton, C. Rorres, Elementary linear algebra with applications, Wiley 7th i. Edition, 1994.

Class : F.Y. B. Sc.(Computer Science) (Semester- I)

Paper Code: CSMT1103

Paper : III

Title of Paper : Practical based on CSMT1101 & CSMT1102

Credit : 2 No. of lectures: 48

A) Learning Objectives:

- Problem solving ability and understanding applications of Graph Theory
- Improve skills to handle abstract algebraic structures such as integers, groups

B) Learning Outcome:

Lead students to apply these mathematical concepts in the study of computer science

Title of Experiments:

Graph Theory:

1. Graphs and Operations on Graphs.
2. Connected Graphs.
3. Eulerian and Hamiltonian Graphs.
4. Trees.
5. Directed Graphs.
6. Miscellaneous

Algebra:

1. Relations and functions.
2. Binary Operations
3. Groups
4. Divisibility and Congruence
5. Matrices and System of linear Equations
6. Miscellaneous