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	Course Code	Title of Course	No. of Credits	No. of Lectures
I	UCSMT111	Graph Theory	2	36
	UCSMT112	Matrix Algebra	2	36
	UCSMT113	Mathematics Practical based on UCSMT111 & UCSMT112	2	48
II	UCSMT121	Discrete Mathematics	2	36
	UCSMT122	Linear Algebra	2	36
	UCSMT123	Mathematics Practical based on UCSMT121 & UCSMT122	2	48

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

Semester	Course Code	Title of Course	No. of Credits	No. of Lectures
I	UCSMT231	Groups and Coding Theory	2	48
	UCSMT232	Numerical Techniques	2	48
	UCSMT233	Mathematics Practical Python Programming Language I	2	48
II	UCSMT241	Computational Geometry	2	48
	UCSMT242	Operation Research	2	48
	UCSMT243	Mathematics Practical Python Programming Language II	2	48

Equivalence of the Old Syllabus with New Syllabus:

Old Course		New Course	
CSMT1101	Graph Theory	UCSMT111	Graph Theory
CSMT1102	Algebra	UCSMT112	Matrix Algebra
CSMT1103	Mathematics Practical based on CSMT1101 & CSMT1102	UCSMT113	Mathematics Practical based on UCSMT111 & UCSMT112

SYLLABUS (CBCS) FOR F. Y. B. Sc.(COMPUTER SCIENCE)
MATHEMATICS
(w.e.f. June, 2022)

Academic Year 2022-2023

Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Course Code: UCSMT111
Course : I Title of Course :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 skillset and analytical abilities for developing computer-based solutions using mathematical concepts

B) Learning Outcome:

- Understanding of algorithms and applications to computer science.
- Students are able to define the basic concept of graphs, directed graphs and weighted graphs.

TOPICS/CONTENTS

Unit 01: Graphs (6 lectures)

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.

Unit 02: Operations on Graphs (4 lectures)

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

Unit 03: Connected Graphs (9 lectures)

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.

Unit 04: Eulerian and Hamiltonian Graphs (5 lectures)

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.

Unit 05: Trees (6 lectures)

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.

Unit 06: Directed Graphs (6 lectures)

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.

Text Book: John Clark and Derek Holtan, *A First Look at Graph Theory*, Allied Publishers
Unit 1: Sections 1.1to 1.4, 1.7
Unit 2: Sections 1.5, 1.8
Unit 3: Sections 1.6, 2.5, 2.6
Unit 4: Sections 3.1 to 3.4
Unit 5: Sections 2.1 to 2.4
Unit 6 : Sections 7.1, 7.2, 8.1, 8.2

Reference Books:

1. Kenneth Rosen, *Discrete Mathematics and Its Applications*, Tata McGraw Hill.
2. Narsingh Deo, *Graph Theory with Application to Computer Science and Engineering*, Prentice Hall.
3. Douglas B. West, *Introduction to Graph Theory*. Pearson Education, Second Edition.

Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Course Code: UCSMT112
Course : II Title of Course :Matrix Algebra
Credit : 2 No. of lectures: 36

A) Learning Objectives:

- To understand properties and operations of the System of Linear Equations.
- To understand basic concepts of Determinants.
- Understanding of how to translate a linear equation into a matrix.

B) Learning Outcome:

- Improves problem-solving ability and understanding of different algebraic structures in Mathematics
- Students are able to define determinants and understand their relationship to matrices.

TOPICS/CONTENTS

Unit 01: Linear Equations (06 lectures)

1.1 Geometry of Linear Equations
1.2 Column Vectors and Linear Equations
1.3 Singular Case

Unit 02: Matrices (12 lectures)

2.1 Matrix Notation.
2.2 Multiplication of a matrix with a Vector.
2.3 Elementary Matrices.
2.4 Matrix Multiplication.
2.5 Gauss Elimination Method.

Unit 03: Inverses and Transposes (12 lectures)

3.1 Inverse of Matrix by Elementary transformations.
3.2 Gauss Jordan method.
3.3 Transpose of Matrix.
3.4 Symmetric Matrices.
3.5 Special Matrices and Application.

Unit 04: Determinants (6 lectures)

4.1 Introduction to Determinants.
4.2 Properties of Determinants
4.3 Cramer's Rule, Volume.

Text Book : Gilbert Strang, *Linear Algebra and its Applications,* Fourth Edition.

Unit 1: Section 1.1, 1.2
Unit 2: Section 1.3 to 1.5
Unit 3: Section 1.6, 1.7

Text Book : David C. Lay, *Linear Algebra and its Applications*, MacDonald Pearson Publication Fourth Edition.

Unit 4: Section 4.1 to 4.3

Reference Books:

1. Howard Anton and others , Elementary Linear Algebra with supplemental Applications , Wiley Student Edition.
2. KantiBhushan Datta , Matrix and Linear Algebra (aided with MATLAB) , Eastern Economic Edition.
3. Franz . F.Hohn , Elementary matrix Algebra Dover Publications , Third Edition.
4. Devi Prasad , Elementary Linear Algebra , Narosa , Third Edition.

Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Course Code: UCSMT113
Course : III
Title of Course: Practical based on UCSMT111 & UCSMT112
Credit : 2 No. of lectures: 48

A) Learning Objectives:

- Problem-solving ability and understanding of applications of Graph Theory.
- Improve skills to handle abstract algebraic structures such as matrices, and determinants.
- To build the necessary skillset and analytical abilities for developing computer-based solutions using mathematical concepts.

B) Learning Outcome:

- Lead students to apply these mathematical concepts in the study of computer science
- Students are able to solve the System of Linear Equations.

Title of Experiments:

Graph Theory:

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

Algebra:

1. Problems on linear Equations.
2. Problems on Matrices I.
3. Problems on Matrices II.
4. Problems on Inverses and Transposes.
5. Problems on Determinants.
6. Miscellaneous.