Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Shivajinagar, Pune – 5

F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU1201
Course Name: Discrete Mathematics

Teaching Scheme: TH: 2 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite: Set Theory, Logic

Course Objectives: To Study

- Propositional Logic, Arguments and Methods of Proofs.
- Graphs, types of graphs
- Operations on graphs viz. Union, Intersection, Ring Sum and Product.
- Connected graphs and its properties.
- Trees and its properties.

Course Outcomes: On completion of the course, student will be able to:-

- To check validity of an argument.
- Apply different methods of proofs.
- Convert real life problems into graph theoretical models
- Check whether two graphs are isomorphic or not.
- Apply basic operations on graphs and connected graphs.
- Find shortest spanning tree for a given graph.

Course Contents:

Chapter 1	**Logic**	08 hours
	1. 1 Propositional logic, Propositional equivalences. 1. 2 Predicates and Quantifiers. 1. 3 Rules of Inference. 1. 4 Validity of an Argument. 1. 5 Direct and Indirect methods of proofs.	
Chapter 2	**Introduction to Graphs**	06 hours
	2.1 Definition, Elementary terminologies and results, Graphs as Models, Special types of graphs. 2.2 Isomorphism of graphs. 2.3 Adjacency and Incidence Matrix of a Graph. 2.4 Subgraphs, induced subgraphs, Vertex deletion, Edge deletion, Complement of a graph and self-complementary graphs. **2.5** Union, Intersection, Ring Sum and Product of graphs, Fusion of	

	vertices.	
Chapter 3	**Connected Graphs**	06 hours
	3.1 Walk, Trail, Path and Cycle: Definitions and elementary properties. 3.2 Distance between two vertices, eccentricity, center, radius and diameter of a graph. 3.3 Isthmus, Cutvetex: Definition and properties. 3.4 Cutset, edge-connectivity, vertex connectivity. 3.5 Weighted Graph and Dijkstra's Algorithm.	
Chapter 4	**Trees**	10 hours
	4.1 Definition, Properties of trees. 4.2 Binary Tree: Definition, examples and properties. 4.3 Tree Traversal: Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal. 4.4 Prefix, Infix and Postfix Notations. 4.5 Spanning Tree: Definition, Properties, Spanning Tree, Kruskal's Algorithm, Prim's algorithm.	
	Total No. of Hours	**30**

Reference Books:

1) A First Look at Graph Theory by John Clark and Derek Holton, Allied Publishers (1st Indian edition), 1995.

2) Graph Theory with Applications to Computer Science and Engineering by Narsingh Deo, Prentice Hall of India (3rd Indian edition), 1986.

3) Discrete Mathematics and it's Applications by Kenneth Rosen, Tata McGraw Hill (Seventh edition), 2011.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU1202
Course Name: Lab Course on 24CsMatU1201

Teaching Scheme: PR: 4 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisite: Set Theory, Logic

Course Objectives: To Study

- Propositional Logic, Arguments and Methods of Proofs.
- Graphs, types of graphs
- Operations on graphs viz. Union, Intersection, Ring Sum and Product.
- Connected graphs and its properties.
- Trees and its properties.

Course Outcomes: On completion of the course, student will be able to:-

- To check validity of an argument.
- Apply different methods of proofs.
- Convert real life problems into graph theoretical models
- Check whether two graphs are isomorphic or not.
- Apply basic operations on graphs and connected graphs.
- Find shortest spanning tree for a given graph.

Course Contents:

	List of practical
Practical 1	Graphs-Types of Graphs.
Practical 2	Adjacency, Incidence Matrix, Application of handshaking Lemma.
Practical 3	Operations on Graphs.
Practical 4	Isomorphism of Graphs.
Practical 5	Eccentricity, centre and radius of a graph
Practical 6	Dijkastra's Algorithm
Practical 7	Connectivity (vertex, edge)
Practical 8	Trees
Practical 9	Fundamental Circuits and cutsets

Practical 10	Tree Traversal algorithms
Practical 11	Binary tree
Practical 12	Kruskal's and Prim's algorithms
Practical 13	Propositional equivalence of Logical arguments
Practical 14	predicates and quantifiers
Practical 15	Validity of an argument and methods of proofs

Note: There will be 4 hours for each practical session per week.

Reference Books:

1) A First Look at Graph Theory by John Clark and Derek Holton, Allied Publishers (1st Indian edition), 1995.

2) Graph Theory with Applications to Computer Science and Engineering by Narsingh Deo, Prentice Hall of India (3rd Indian edition), 1986.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU2201
Course Name: Matrix Theory

Teaching Scheme: TH: 2 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisites: Set Theory, Matrices, Polynomials, System of Simultaneous Equations.

Course Objectives: To study

- Relations and types of relations.
- Determinants, eigenvalues and eigenvectors.
- System of linear equations.

Course Outcomes:

On completion of the course, student will be able to:-

- Understand various properties of relations.
- Solve system of linear equations.
- Find eigenvalues and eigenvectors of a square matrix.
- Find rank of a matrix.

Course Contents:

Chapter 1	**Relations**	07 hours
	1. 1 Relations, types of relations, Equivalence relations, Partial ordering: definitions and examples 1. 2 Transitive closure and Warshall's Algorithm. 1. 3 Matrix representation and composition of relations.	
Chapter 2	**System of linear equations**	14 hours
	2.1 Row reduction and echelon form of a matrix 2.2 The matrix equation Ax=b 2.3 Solution sets of Linear systems (Gauss elimination method, Gauss – Jordan elimination method, LU decomposition method.) 2.4 Application of Linear System 2.5 Linear Independence 2.6 Introduction to Linear Transformations 2.7 The matrix of Linear Transformation	

Chapter 3	**Determinants**	5 hours
	3.1 Determinants by Cofactor Expansion, adjoint of a matrix 3.2 Evaluating Determinants by Row Reduction. 3.3 Properties of the Determinant Function.	
Chapter 4	**Introduction to Eigenvalues and Eigenvectors**	4 hours
	4.1 Method to find Eigenvalues of a matrix 4.2 To find Eigenvectors corresponding to each eigenvalue of a matrix	
	Total No. of hours	**30** hours

Reference Books:

1) Elementary Linear Algebra (Applications Version) by Howard Anton, Chriss Rorres, John Wiley and Sons Inc.(Ninth edition), 2010 .

2) Linear Algebra and Its Applications by David Lay, Steven Lay and Judi McDonald, Pearson, Fifth edition.

3) Discrete Mathematical Structures by Kolman, Busby and Ross, PHI Publications, Sixth edition, 2010.

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F.Y. B.Sc. (Computer Science)
(2024 Course under NEP)

Course Code: 24CsMatU2202
Course Name: Lab Course on 24CsMatU2201

Teaching Scheme: PR: 4 hrs /Week **Credit : 02**
Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Prerequisites: Set Theory, Matrices, Polynomials, System of Simultaneous Equations.

Course Objectives: To study

- Relations and types of relations.
- Determinants, eigenvalues and eigenvectors.
- System of linear equations.

Course Outcomes:

On completion of the course, student will be able to:-

- Understand various properties of relations.
- Solve system of linear equations.
- Find eigenvalues and eigenvectors of a square matrix.
- Find rank of a matrix.

Course Contents:

	List of practicals
Practical 1	Introduction to Scilab
Practical 2	Learning of Scilab commands
Practical 3	Equivalence relations
Practical 4	Warshall's Algorithm
Practical 5	Partial order relations
Practical 6	Evaluation of Determinants of matrices
Practical 7	Practical session using Scilab of practical 6
Practical 8	Gaussian Elimination method
Practical 9	Practical session using Scilab of practical 8
Practical 10	Gauss- Jordan Elimination method
Practical 11	Practical session using Scilab of practical 10

Practical 12	LU decomposition method
Practical 13	Practical session using Scilab of practical 12
Practical 14	Eigenvalues and eigenvectors
Practical 15	Practical session using Scilab of practical 14

Note: There will be 4 hours for each practical session per week.

Reference Books:

1) Elementary Linear Algebra (Applications Version) by Howard Anton, Chriss Rorres, John Wiley and Sons Inc.(Ninth edition), 2010 .

2) Linear Algebra and Its Applications by David Lay, Steven Lay and Judi McDonald, Pearson, Fifth edition.

3) Discrete Mathematical Structures by Kolman, Busby and Ross, PHI Publications, Sixth edition, 2010.

4) Modeling and Simulations in Scilab/Scicos by Stephen Campbell, Jean Philippe Chanceller, Ramine Nikoukhah, Springer, 2006.