

B.Tech. Year – 2 (Sem III)

Subject Code: 01MA0231

Subject Name: Discrete Mathematics and Graph Theory

Objective:

Engineering Mathematics is one of the essential tools for learning Technology, Engineering and Sciences. In this course students will come across a number of theorems and proofs. This course is aimed to cover a variety of different problems in Graph Theory. Theorems will be stated and proved formally using various techniques. Various graphs algorithms will also be taught along with its analysis.

Credits Earned: 5 Credits

Course Outcomes: After completion of this course, student will be able to

- Apply concept of Predicate Calculus In computer science like design of computing machines, artificial intelligence, definition of data structures for programming languages etc.
- Understand the concepts of graph theory, Lattices, and Boolean Algebra in analysis of various computer science applications.
- Apply the knowledge of Boolean algebra in computer science for its wide applicability in switching theory, building basic electronic circuits and design of digital computers.
- Understand the application of various type of graphs in real life problem.
- Apply abstract concepts of graph theory in modeling and solving non-trivial problems in different field of study.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
4	2	-	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Predicate Calculus: Proposition, Logical operators and expressions, predicates, Rules of quantifiers. Rules of Inference for propositions and predicates.	10
2	Lattices : Relation, Poset, Hasse diagram, Lattice as Poset Properties of lattices, Lattice as an algebraic system, Duality	10
3	Boolean Algebra: Definition and properties of Boolean algebra, Sub-boolean algebra Atoms and anti-atoms, Boolean expression and their equivalences Minterms and Maxterms, values of Boolean expressions Canonical forms, Karnaugh map	10
4	Concepts of Graphs and Trees: Definition of a graph theory, incidence and degree, walks, paths, circuits, Connectedness, Eulerian and Hamiltonian graphs, Trees, basic properties of trees, Binary trees Spanning and Minimal spanning trees	10
5	Matrix representations and Graph Algorithms: Connectivity and Separability, fundamental circuits and cut sets Isomorphism of graphs: 1 and 2-isomorphism Matrix representation of graphs, adjacency and incidence matrix Graph theoretical algorithms: dijkstra, prims and kruskal	10
6	Planar graphs and their properties: Planarity of graphs, Planar graphs Stereographic projection and embedding on a sphere Kurtowski's two graphs Euler's formula, Detection of planarity and elementary reduction.	10
	Total Hours	60

Recommended Textbooks:

1. Rosen Kenneth: Discrete mathematics and its applications. McGraw hill- New Delhi.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI
3. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, PHI, 1974
4. B. Kolman and R.C. Busby: Discrete mathematical structures for computer science, Prantice Hall, New-Delhi.
5. J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.
6. S. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.
7. [Thomas S. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein: Introduction to Algorithms, The MIT Press.](#)

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. <http://mathworld.wolfram.com/>
2. <http://en.wikipedia.org/wiki/Math>