

Subject Code: 01CT0310

Subject Name: Discrete Mathematics and Graph Theory

B. Tech. Year – II (Semester III)

Objective: Engineering Mathematics is one of the very useful tools for learning Technology, Engineering and Sciences. In this course Learners will come across a number of standard concepts which helps them to solve core real world problems. This course is aimed to cover a variety of different concepts in Graph Theory. Theorems will be stated and proved formally using various Mathematical rules. Various graphs algorithms will also be discussed along with detail analysis.

Credits Earned: 04 Credits

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

1. Understand and apply logical propositions using logic & predicate and Boolean algebra (Apply).
2. Understand the properties of relations, equivalence and partial order relations (Understand).
3. Apply concept of Boolean algebra in switching theory and building basic electronic circuits (Apply).
4. Apply and analyze the concepts of shortest path algorithm to determine the solution to complex optimization problem (Analyze).
5. Apply concepts of graph theory to solve real life problems (Apply).

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
3	1	0	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact
1	Logic and Predicates: Introduction, logical expressions and operators, predicates, rules of quantifiers, rules of inference for predicates and propositions.	6
2	Lattices: Different types of relations, partially ordered set, Hasse diagram, lattice as partially ordered set, properties of lattices, lattice as an algebraic system, concept of duality	6
3	Boolean Algebra: Introduction to Boolean algebra and properties, sub-Boolean algebra, atoms and anti-atoms, Boolean expression and its equivalences, minterms and maxterms, values of Boolean expressions, canonical forms, Karnaugh map	6
4	Graphs and Trees: Introduction to graph theory, degree and incidence, walks, paths, circuits, reachability in graphs, Hamilton graphs and Euler graphs, introduction to acyclic graph (tree) and its properties, binary tree, spanning tree and minimal spanning tree.	8
5	Representation Graph using Matrix: Edge and vertex connectivity, separability, fundamental cycles and cut sets graph isomorphism: 1-isomorphic and 2-isomorphic graphs, matrix form of graphs, adjacency and incidence matrix, Dijkstra's algorithm.	8
6	Planar and Non-planar Graphs: Planar and non-planar graphs, stereographic graph embedding on a sphere, Kuratowski's first and second graphs, Euler's formula, detection of planarity and elementary reduction.	8
	Total Hours	42

Suggested Text books / Reference books:

1. Rosen Kenneth: Discrete Mathematics and its Applications. McGraw Hill Publication- New Delhi, 8th edition, 2021.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI, 1st edition, 1977
3. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, PHI, 1st edition 1974.
4. B.Kolman and R.C. Busby: Discrete Mathematical Structures for Computer Science, Prantice Hall, New-Delhi, 2nd edition 1984.
5. J.P. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer Science, McGraw Hill Publication- New Delhi, 8th edition 2017.
6. S. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd. 1st edition, 2012

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%	05%

Instructional Method:

1. 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.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical exam will be conducted at the end of semester for evaluation of learners in tutorial work.
4. Students will use supplementary resources such as online videos, NPTEL videos, E-courses, etc.

Supplementary Resources:

1. www.tutorialspoint.com/graph_theory
2. www.ied.edu.hk/has/phys/de/de-ba.htm