FACULTY OF ENGINEERING & TECHNOLOGY

Second Year Bachelor of Engineering

Course Code: 102040405

Course Title: Discrete Mathematics

Type of Course: Basic Science Course

Course Objectives: This course provides students to develop logical thinking and its application to computer science. The course stresses on mathematical reasoning and describes different ways in which mathematical problems could be solved. Students will learn about topics such as sets and functions, logic and proofs, algebraic structures, graph theory and other important discrete math concepts**.**

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	2	0	4	40 / 14	-	60/21	-	100 / 35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Set Theory** Introduction, Finite Set, Cardinality of Finite Sets, Power Set, Cartesian Product, Properties of Sets, Venn Diagrams, Bit Vector Implementation of Sets.	04
2	**Relations** Definition, Binary Relation, Representation, Domain, Range, Universal Relation, Void Relation, Union, Intersection, and Complement Operations on Relations, Properties of Binary Relations in a Set: Reflexive, Symmetric, Transitive, Anti-symmetric Relations, Relation Matrix and Graph of a Relation; Partition and Covering of a Set, Equivalence Relation, Equivalence Classes, Compatibility Relation, Maximum Compatibility Block, Composite Relation.	04
3	**Functions** Introduction & Definition, Co-domain, Range, Injective, Surjective, Bijective, Composition of functions, Identity map, Condition of a function to be invertible.	03
4	**Counting** The Basics of Counting, The Pigeonhole Principle, Permutations and Combination.	02

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
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5	**Propositional Logic** Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications	**03**
6	**Predicate Logic** Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences.	**03**
7	**Partial Ordering** Definition, Examples, Simple or Linear Ordering, Totally Ordered Set (Chain), Frequently Used Partially Ordered Relations, Representation of Partially Ordered Sets, Hesse Diagrams	**03**
8	**Lattices** Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.	**02**
9	**Algebraic Structures** Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.	**10**
10	**Graph Theory** Definition of a graph, Incidence and Degree, Isomorphic Graphs, Subgraphs, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs and Components, Euler Graphs, Operations on Graphs, Hamiltonian Paths and Circuits, Trees, Some Properties of Trees, Pendant Vertices in a Tree, Distance and Centers in a Tree, Rooted and Binary Tree, Spanning Tree, Fundamental Circuits, Incidence Matrix, Circuit Matrix, Applications	**10**

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	25%	20%	15%	---	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Discrete Mathematics and Its Applications – Kenneth H. Rosen, McGraw-Hill
2	Elements of Discrete Mathematics – Liu and Mohapatra, McGraw Hill Publications
3	Discrete Mathematical Structures with Applications to Computer Science J P Trimblay, R Manohar, Tata McGraw Hill Publications
4	Graph Theory with Applications to Engineering and Computer Science Narsinh Deo, Prentice Hall

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Upon completion of the course, the student will be able to use logical notation and students can be able to perform logical proofs.	**25**
CO-2	Students will be able to apply recursive functions and solve recurrence relations. Moreover, they will be able to determine equivalent logic expressions.	**25**
CO-3	Students can be able to understand abstract notions by learning algebraic structures.	**25**
CO-4	By learning Graph Theory students can be able to know the applications in the field of Computer Science.	**25**

List of Practicals / Tutorials:

1	Assignment on Set Theory
2	Assignment on Relations
3	Assignment on Functions
4	Assignment on Counting and Propositional Logic
5	Assignment on Predicate Logic
6	Assignment on Partial Ordering
7	Assignment on Lattices and Algebraic Structures
8	Assignment on Algebraic Structures
9	Assignment on Graph Theory
10	Assignment on Graph Theory

Supplementary learning Material:

1 NPTEL Cours

2 MIT Open Course Ware in Computer Science

Curriculum Revision:

Version:	**1**
Drafted on (Month-Year):	**March 2021**
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	

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