Course Code	21MAB302T	Course Name	Discrete Mathematics	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	21MAB102T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR)	*The purpose of learning this course is to:*	Learning	Program Outcomes (PO)											
			1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
CLR-1:	Enhance the mathematical skills by applying the principles of sets and functions in storage, communication and processing the data	*Blooms Level (1-6)*	*Engineering Knowledge*	*Problem Analysis*	*Design and Development*	*Analysis, Design and Research*	*Modern Tool Usage*	*Society and Culture*	*Environment & Sustainability*	*Ethics*	*Individual and Team Work*	*Communication*	*Project Mgt. and Finance*	*Life Long Learning*
CLR-2:	Culminate in extensive use and application of counting strategies in enumeration of data													
CLR-3:	Apply the rules of inference theory to design electronic circuits and to verify computer programs													
CLR-4:	Apply the knowledge of algebraic structures and coding theory to solve problems on detection and correction of errors occurring in binary communication channels													
CLR-5:	Acquire knowledge to solve problems in communication networks using graph models													

Course Outcomes (CO):	*At the end of this course, learners will be able to:*												
CO-1:	Apply the concepts of set theory and its operations in data structures and mathematical modelling languages	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-
CO-2:	Solve problems using counting techniques and understanding the basics of number theory	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-
CO-3:	Comprehend and validate the logical arguments using concepts of inference theory	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-
CO-4:	Inculcate the curiosity for applying the concepts of algebraic structures to coding theory	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-
CO-5:	Apply graph theory techniques to solve wide variety of real world problems	*4*	*3*	*3*	-	-	-	-	-	-	-	-	-

Unit-1: Set Theory

Sets - Operations on sets - Laws of set theory - Partition of a set - Cartesian product of sets - Relations - Properties - Equivalence relation and partial order relation - Poset - Graphs of relations - Digraphs - Hasse diagram - Closures of relations - Transitive closure and Warshall's algorithm - Functions - Types of functions - Composition of functions - Properties - Inverse of functions - Necessary and sufficient condition for existence of inverse function - Uniqueness of identity - Inverse of composition.

Unit-2: Combinatorics and Number Theory

Permutation and combination - Addition and product rules - Principle of inclusion and exclusion - Pigeon-hole principle and generalized pigeon-hole principle - Divisibility and prime numbers - Fundamental theorem of arithmetic - Prime factorization - Division algorithm- Greatest common divisor - Properties - Euclid's algorithm - Least common multiple.

Unit-3: Mathematical Logic

Propositions and logical operators - Truth tables - Converse, inverse and contrapositive - Tautology and contradiction - Equivalences - Implications - Laws of logic - Inference theory - Rules of inference - Direct method - CP rule – Inconsistency - Indirect method - Principle of mathematical induction.

Unit-4: Algebraic structures and Coding theory

Groups - Permutation group - Cyclic group - Properties - Subgroup- Group homomorphism - Properties - Ring - Zero divisor - Integral domain- Field -Coding theory - Group code - Hamming codes - Error correction using matrices - Error correction - Decoding group codes.

Unit-5: Graph Theory

Definitions - Handshaking theorem - Some special graphs - Isomorphism of graphs - Paths, cycles and circuits - Connectivity in undirected graphs - Eulerian and Hamiltonian graphs - Matrix representation of graphs- Isomorphism using adjacency - Digraphs - Trees - Properties - Spanning tree - Kruskal's algorithm - Graph coloring - Chromatic number- Four color theorem (statement only).

Learning Resources	1. H. Kenneth Rosen, Discrete Mathematics and its Application, Seventh edition, Tata McGraw-Hill Publishing company PVT. Ltd., New Delhi, 2012. 2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with applications to Computer Science, 35th edition, Tata McGraw Hill Publishing Co., 2008. 3. Narsing Deo, Graph Theory with applications to Engineering and Computer science, Prentice-Hall of India pvt. Ltd., New Delhi, 2004. 4. C.L. Liu, Elements of Discrete Mathematics, 4th Edition, McGraw Higher ED, 2012. 5. R.P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 4th Edition, Pearson Education Asia, Delhi, 2007. 6. T. Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hill, 2015.

Student learning shall be assessed with a weightage of 60% for internal assessment and 40% for end semester examination

	Bloom's Level of Thinking	**Continuous Learning Assessment (CLA) - By the Course Faculty**				**By The CoE**	
		Formative CLA-1 Average of unit test (50%)		**Engineering Knowledge and Problem Analysis** CLA-2 (10%)		**Summative** Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	20%	-	20%	-
Level 2	Understand	20%	-	20%	-	20%	-
Level 3	Apply	30%	-	30%	-	30%	-
Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers		
a) Experts from Industry	**b) Experts from Higher Technical Institutions**	**c) Internal Experts**
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