Course Code	21MAB302T	Course Name	DISCRETE MATHEMATICS	Course Category	B	BASIC SCIENCES	L	T	P	C
							3	1	0	4

Pre-requisite Courses	*Nil*	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:***
CLR-1:	*enhance the mathematical skills by applying the principles of sets and functions in storage, communication and processing the data*
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:***	Program Outcomes (PO)												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12			
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CO-1:	*apply the concepts of set theory and its operations in data structures and mathematical modelling languages*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2:	*solve problems using counting techniques and understanding the basics of number theory*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-3:	*comprehend and validate the logical arguments using concepts of inference theory*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-4:	*inculcate the curiosity for applying the concepts of algebraic structures to coding theory*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-5:	*apply graph theory techniques to solve wide variety of real world problems*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-

Unit-1 - Set Theory	***12 Hour***
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	***12 Hour***
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	***12 Hour***
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	***12 Hour***
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	***12 Hour***
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.*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		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

Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
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		3. *Dr. L. Shobana, SRMIST*