Course Code	18MAB302T	Course Name	DISCRTE MATHEMATICS FOR ENGINEERS	Course Category	BS	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB102T	Co-requisite Courses	NIl	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

CourseLearning Rationale(CLR):	The purpose of learning this course is :
CLR-1 :	Apply set theory, functions and relations in storage, communication and manipulation of data
CLR-2 :	Apply number theory concepts in computer engineering such as public key crypto system.
CLR-3 :	Apply mathematical reasoning in computer science such as design of computer circuit, verification of programs.
CLR-4 :	Learning about groups, rings and fields. Solving problems on coding theory.
CLR-5 :	Using graph models in computer network and shortest path problems Apply graph coloring in problems involving scheduling and assignments
CLR-6 :	Apply mathematical reasoning, combinatorial analysis, algebraic structures and graph theory in solving mathematical problems as applied to the

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)															
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CLO-1 :	problem solving in sets, relations and functions.	3	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
CLO-2 :	Solving problems in basic counting principles, inclusion exclusion and number theory.	3	85	80	M	H	-	M	M	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Solving problems of mathematical logic, inference theory and mathematical induction.	3	85	80	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-
CLO-4 :	Gaining knowledge in groups, rings and fields. Solving problems in coding theory.	3	85	80	M	H	-	M	-	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Gaining knowledge in graphs and properties. Learning about trees, minimum spanning trees and graph coloring	3	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
CLO-6 :	Learning mathematical reasoning, combinatorial analysis, algebraic structures and graph theory	3	85	80	L	L	L	H	H	H	L	H	H	H	-	H	-	-	-

Duration (hour)	12	Learning Unit / Module 1	Proposed Date & Hour	Conducted Date & Hour
S-1	SLO-1	Sets and examples. Operations on sets.		
	SLO-2	Laws of Set theory- Proving set identities using laws of set theory.		
	SLO-1	Partition of a set - examples.		

S-2	SLO- 2	Cartesian product of sets.		
S-3	SLO- 1	Relations - Properties.		
	SLO- 2	Equivalence relation and partial order relation		
S-4	SLO-1	Problem solving using tutorial sheet 1		
	SLO-2			
S-5	SLO- 1	Poset - Graphs of relations Digraphs		
	SLO- 2	Hasse diagram - problems.		
S-6	SLO- 1	Closures of relations- examples		
	SLO- 2	Transitive closure and Warshall's algorithm		
S-7	SLO- 1	Functions - definitions, domain and range of a function- examples		
	SLO- 2	Types of functions- one- one and onto- bijection- examples.		
S-8	SLO-1	Problem solving using tutorial sheet 2		
	SLO-2			
S-9	SLO- 1	Composition of functions -examples		
	SLO- 2	Associatiivity of composition of functions - Identity and inverse of functions		
S-10	SLO- 1	Necessary and sufficiency of existence of inverse of a function.		
	SLO- 2	Uniqueness of identity		
S-11	SLO- 1	Inverse of composition		
	SLO- 2	Checking if a given function is bijection and if so, finding inverse, domain and range- problems.		
S-12	SLO-1	Problem solving using tutorial sheet 3		
	SLO- 2	Applications of sets, relations, functions		
Duration (hour)	**12**	**Learning Unit -II/ Module 2**	**Proposed Date & Hour**	**Conducted Date & Hour**
S-1	SLO-1	Permutation and Combination		
	SLO-2	Simple problems using addition and product rules.		
S-2	SLO-1	Principle of inclusion and exclusion		
	SLO-2	Problems using inclusion and exclusion principle.		
S-3	SLO-1	Pigeon-hole principle and generalized pigeon-hole principle.		
	SLO-2	Problems on pigeon-hole principle.		

S-4	SLO-1	Problem solving using tutorial sheet 4		
	SLO-2			
S-5	SLO-1	Divisibility and prime numbers.		
	SLO-2	Fundamental theorem of arithmetic – problems		
S-6	SLO-1	Finding prime factorization of a given number		
	SLO-2	Some more problems using fundamental theorem of arithmetic.		
S-7	SLO-1	Division algorithm- greatest common divisor and properties-problems.		
	SLO-2	Euclid's algorithm for finding GCD(a,b)- examples..		
S-8	SLO-1	Problem solving using tutorial sheet 5		
	SLO-2			
S-9	SLO-1	Problems using Euclid's algorithm.		
	SLO-2	Least common Multiple(LCM)- relation between LCM and GCD		
S-10	SLO-1	Problems on LCM.		
	SLO-2	Finding LCM and GCD using prime factorization.		
S-11	SLO-1	Finding GCD and LCM using Euclid's algorithm		
	SLO-2	More problems on GCD and LCM.		
S-12	SLO-1	Problem solving using tutorial sheet 6		
	SLO-2	Application of permutation and combinations, Pigeon-hole principle		
Duration (hour)	**12**	**Learning Unit -III/ Module 3**	**Proposed Date & Hour**	**Conducted Date & Hour**
S-1	SLO-1	Propositions and Logical operators		
	SLO-2	Truth values and truth tables.		
S-2	SLO-1	Propositions generated by a set-Symbolic writing using conditional and biconditional connectives.		
	SLO-2	Writing converse inverse and contra positive of a given conditional.		
S-3	SLO-1	Tautology, contradiction and contingency-examples.		
	SLO-2	Proving tautology and contradiction using truth table method.		
S-4	SLO-1	Problem solving using tutorial sheet 7		
	SLO-2			
S-5	SLO-1	Equivalences– truth table method to prove equivalence		
	SLO-2	Implications- truth table method to prove implications.		
S-6	SLO-1	Laws of logic and some equivalences.		
	SLO-2	Proving equivalences and implications using laws of logic.		
S-7	SLO-1	Rules of inference – Rule P, Rule T and Rule CP		
	SLO-2	Direct proofs		
	SLO-1			

S-8	SLO-2	Problem solving using tutorial sheet 8		
S-9	SLO-1	Problems using direct method.		
	SLO-2	Problems using CP rule.		
S-10	SLO-1	Inconsistency and indirect method of proof.		
	SLO-2	Inconsistent premises and proof by contradiction (indirect method).		
S-11	SLO-1	Principle of mathematical induction.		
	SLO-1	Problems based on Mathematical Induction		
S-12	SLO-1	Problem solving using tutorial sheet 9		
	SLO-2	Application of propositional calculus in Engineering.		
Duration (hour)	**12**	**Learning Unit -IV/ Module 4**	**Proposed Date & Hour**	**Conducted Date & Hour**
S-1	SLO-1	Binary operation on a set- Groups and axioms of groups		
	SLO-2	Properties of groups.		
S-2	SLO-1	Permutation group, equivalence classes with addition modulo m and multiplication modulo m.		
	SLO- 2	Cyclic groups and properties.		
S-3	SLO-1	Subgroups and necessary and sufficiency of a subset to be a subgroup		
	SLO- 2	Group homomorphism and properties.		
S-4	SLO-1	Problem solving Tutorial sheet 10		
	SLO- 2			
S-5	SLO-1	Rings- definition and examples..Zero devisors		
	SLO-2	Integral domain- definition , examples and properties		
S-6	SLO-1	Fields – definition, examples and properties		
	SLO- 2	Coding Theory – Encoders and decoders- Hamming codes		
S-7	SLO-1	Hamming distance. Error detected by an encoding function		
	SLO- 2	examples		
S-8	SLO-1	Problem solving using tutorial sheet 11		
	SLO- 2			
S-9	SLO-1	Error correction using matrices.		
	SLO- 2	Problems on error correction using matrices		
S-10	SLO-1	Group codes-error correction in group codes-parity check matrix		
	SLO- 2	Problems on error correction in group codes.		
S-11	SLO-1	Procedure for decoding group codes		
	SLO- 2	Problems on decoding group codes		
S-12	SLO-1	Problem solving using tutorial sheet 12		
	SLO- 2	Applications of groups and coding theory in Engineering.		
Duration (hour)	**12**	**Learning Unit -V/ Module 5**	**Proposed Date & Hour**	**Conducted Date & Hour**
S-1	SLO-1	Basic concepts - Basic Definitions- degree and Hand shaking theorem.		
	SLO-2	Some Special Graphs – complete, regular and bipartite graphs.		
S-2	SLO-1	Isomorphism of graphs – necessary conditions		
	SLO- 2	Isomorphism- simple examples.		

S-3	SLO-1	Paths, cycles and circuits		
	SLO- 2	Connectivity in undirected graphs – connected graphs and odd degree vertices		
S-4	SLO-1	Problem solving using tutorial sheet 13		
	SLO- 2			
S-5	SLO-1	Eulerian and Hamiltonian graphs		
	SLO-2	Necessary and sufficient condition for a graph to be Eulerian		
S-6	SLO-1	Matrix representation of graphs- adjacent and incidence matrices and examples		
	SLO- 2	Isomorphism using adjacency.		
S-7	SLO-1	Digraphs – in degree and out degree – Hand shaking theorem.		
	SLO- 2	Verification of hand shaking theorem in digraphs.		
S-8	SLO-1	Problem solving using tutorial sheet 14		
	SLO- 2			
S-9	SLO-1	Graph colouring – chromatic number-examples.		
	SLO-2	Four colour theorem(statement only) and problems		
S-10	SLO-1	Trees – definitions and examples. Properties.		
	SLO- 2	Properties continued.		
S-11	SLO-1	Spanning trees – examples.		
	SLO- 2	Krushkal's algorithm for minimum spanning trees.		
S-12	SLO-1	Problem solving using tutorial sheet 15		
	SLO- 2	Application of graph theory in Engineering		

Prepared By
Mr M Kannan
(Course Coordinator)

HOD/MATHEMATICS

4. Hands-on Programming with R,- GarrettGrolemund
5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander

	Level of Thinking	Continuous Assessment				Final Examination (50%)
		CLAT– 1 (10%)	CLAT – 2 (15%)	CLAT – 3 (15%)	CLAT – 4 (10%) #	
Level 1	Remember	40 %	30 %	30 %	30 %	30 %
	Understand					
Level 2	Apply	40 %	40 %	40 %	40 %	40 %
	Analyze					
Level 3	Evaluate	20 %	30 %	30 %	30 %	30 %
	Create					

 # CA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,
SLO – Session Learning Outcome

Course Designers							
(a) Experts from Industry							
1	Experts From TCS						
(b) Experts from Higher Technical Institutions							
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(b) Internal Experts							
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