Course Title:	Discrete Mathematics				Course Code:	R204GA05401
Class & Sem:	II B. Tech II Sem – Sec - B				Regulations:	SRIT R20
Course Structure:	Theory	Tutorial	Lab	Credits	Core/Elective:	Core
	3	1	-	3		
Instructor 1:	Mr. M. Narasimhulu			AY:	2022-23	

1. **Prerequisites:** A higher education mathematics is required to study this course.

2. Course Description: This course will introduce and illustrate in the elementary discrete mathematics for computer science and engineering students. To equip the students with standard concepts like formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles.

3. Detailed Syllabus:

UNIT 1: Mathematical Logic	**(11 Periods)**
Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. **Predicate Calculus:** Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.	
UNIT 2: Set Theory	**(15 Periods)**
Introduction: Operations on Binary Sets, Principle of Inclusion and Exclusion, Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams. **Functions:** Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.	
UNIT 3: Algebraic Structures and Number Theory	**(14 Periods)**
Algebraic Structures: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. **Number Theory:** Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem).	
UNIT 4: Combinatorics	**(11 Periods)**
Basic of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, The Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.	
UNIT 5: Graph Theory	**(12 Periods)**
Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees.	
	Total Periods: 62

4. Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill, 2015.

2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rdEdition, Tata McGraw Hill,2008.
5. Reference Books
1. Advanced Engineering Mathematics, by Erwin Kreyszig, 10thEdition, Wiley India, 2014. 2. Higher Engineering Mathematics, by B.V.Ramana, Sixth Reprint, Mc Graw Hill publishers, 2008. 3. Advanced Engineering Mathematics, by Alan Jeffrey, 1st Edition, Elsevier, 2010.

6. Course Outcomes:

On successful completion of this course, the students will be able to

S.No	Course Outcomes	Cognitive Level
1	Illustrate discrete mathematic components like statements, logic, sets, structures, numbers and combinatorics.	Understand
2	Evaluate and simplify propositional and predicate calculus using inference theory.	Apply
3	Perform the operations on Sets, Relations and functions and their properties.	Apply
4	Identify algebraic systems and use general properties on number theory.	Apply
5	Use combinatorics solving the counting problems.	Apply
6	Use graph algorithms for representing, identifying, generating and evaluating the Graphs.	Apply

7. Lesson Plan

***(Mode of delivery:** *Chalk & Talk, ICT, Group Discussion, Demonstration, Tutorial, Industrial Visit, Seminar)*

Sr. No.	Topics to be covered	Mode of Delivery	Periods Required	Books followed	Scheduled Date
	UNIT 1: Mathematical Logic				
1	Statements and Notations	C&T	**1**	T1	28-02-23
2	Connectives, Well Formed Formulas	C&T, ICT	**1**	T1	1-03-23
3	Truth Tables, Tautologies	C&T	**1**	T1	3-03-23
4	Equivalence of Formulas, Duality Law	ICT	**1**	T1	3-03-23
5	Tautological Implications	C&T	**1**	T1	6-03-23
6	Normal Forms	C&T	**1**	T1	7-03-23
7	Theory of Inference for Statement Calculus, Consistency of Premises	ICT	**1**	T1	10-03-23
8	Indirect Method of Proof	C&T	**1**	T1	10-03-23
9	Predicative Logic, Statement Functions	ICT	**1**	T1	13-03-23
10	Variables and Quantifiers, Free and Bound Variables	ICT	**1**	T1	14-03-23
11	Inference Theory for Predicate Calculus.	C&T	**1**	T1	15-03-23
	Total Periods required for Unit-1		**11**		
	UNIT 2: Set Theory				
12	Operations on Binary Sets	C&T	**2**	T1	17-03-23
13	Principle of Inclusion and Exclusion	ICT	**1**	T1	20-03-23
14	Properties of Binary Relations	ICT	**1**	T1	21-03-23
15	Relation Matrix and Digraph	C&T	**1**	T1	24-03-23
16	Operations on Relations, Partition and Covering	ICT	**1**	T1	24-03-23
17	Transitive Closure	C&T	**1**	T1	27-03-23
18	Equivalence	ICT	**1**	T1	28-03-23
19	Compatibility and Partial Ordering Relations	ICT	**1**	T1	29-03-23
20	Hasse Diagrams	C&T	**1**	T1	31-03-23

21	Bijective Functions, Composition of Functions	ICT	**1**	T1	31-03-23
22	Inverse Functions	C&T	**1**	T1	3-04-23
23	Permutation Functions	C&T	**1**	T1	3-04-23
24	Recursive Functions	C&T	**1**	T1	5-04-23
25	Lattice and its Properties	C&T	**1**	T1	10-04-23
	Total Classes required for Unit-2		**15**		
	UNIT 3: Algebraic Structures and Number Theory				
26	Algebraic Systems	ICT	**1**	T1	11-4-23
27	Examples,	ICT	**1**	T1	12-04-23
28	General Properties	ICT	**1**	T1	14-04-23
29	Semi Groups and Monoids	ICT	**½**	T1	14-04-23
30	Homomorphism of Semi Groups and Monoids	ICT	**½**	T1	14-04-23
31	Group, Subgroup	ICT	**1**	T1	17-04-23
32	Abelian Group, Homomorphism	ICT	**1**	T1	18-04-23
33	Isomorphism.	ICT	**1**	T1	19-04-23
34	Properties of Integers	ICT	**1**	T1	21-04-23
35	Division Theorem, The Greatest Common Divisor	ICT	**1**	T1	21-04-23
36	Euclidean Algorithm, Least Common Multiple	C&T	**2**	T1	1-05-23
37	Testing for Prime Numbers	ICT	**1**	T1	3-05-23
	The Fundamental Theorem of Arithmetic	ICT	**1**	T1	5-05-23
	Modular Arithmetic (Fermat's Theorem and Euler's Theorem).	ICT	**1**	T1	5-05-23
	Total Classes required for Unit-3		**14**		
	UNIT 4: Combinatorics				
38	Basic of Counting, Permutations	C&T	**1**	T1	8-05-23
39	Permutations with Repetitions	C&T	**1**	T1	9-05-23
40	Circular Permutations	C&T	**1**	T1	10-05-23
41	Restricted Permutations	ICT	**1**	T1	12-05-23
42	Combinations, Restricted Combinations	ICT	**1**	T1	12-05-23
43	Generating Functions of Permutations and Combinations	ICT	**1**	T1	15-05-23
44	Binomial and Multinomial Coefficients	ICT	**1**	T1	16-05-23
45	Binomial and Multinomial Theorems	ICT	**1**	T1	17-05-23
46	The Principles of Inclusion–Exclusion	ICT	**1**	T1	19-05-23
47	Pigeonhole Principle and its Application	C&T	**2**	T1	19-05-23
	Total Classes required for Unit-4		**11**		
	UNIT 5: Graph Theory				
48	Basic Concepts of Graphs, Sub graphs	C&T	**½**	T1	22-05-23
49	Matrix Representation of Graphs	C&T	**½**	T1	22-05-23
50	Adjacency Matrices	C&T	**½**	T1	23-05-23
51	Incidence Matrices,	C&T	**½**	T1	23-05-23
52	Isomorphic Graphs	C&T	**1**	T1	24-05-23
53	Paths and Circuits	ICT	**1**	T1	26-05-23
54	Eulerian and Hamiltonian Graphs	ICT	**1**	T1	26-05-23
55	Multigraphs, Planar Graphs,	ICT	**1**	T1	29-05-23
56	Euler's Formula	ICT	**1**	T1	30-05-23
57	Graph Coloring and Covering	C&T	**1**	T1	31-05-23
58	Chromatic Number	C&T	**1**	T1	01-06-23

58	Spanning Trees	ICT	**1**	T1	5-06-23
59	Algorithms for Spanning Trees.	ICT	**1**	T1	6-06-23
Total Classes required for Unit-5			**11**		
Total Number of Classes Required : 62+3=65					

8. Additional Topics:

Sr. No.	Topic	Course Outcome
1	Contradiction and Contingency	CO1
2	Closures of Relations	CO2
3	Planar Graph Vs Non-Planar Graphs	CO6

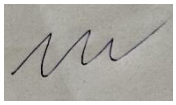
9. Course Assessment & Evaluation:

Mode of assessment	Frequency	Marks
Mid-Term Examinations (Internal)	Two exams CIE-1 and CIE-2 will be conducted. The consolidated CIE marks will be arrived by considering the marks secured by the student in both the CIEs with 80% weightage given to the better CIE and 20% to the other. For each theory course, during the semester, there shall be two CAAs. Each CAA will be evaluated for 10 marks. The consolidated CAA marks will be arrived by considering the average of marks secured by the student in both the CAAs. The final marks for CIA (for 40 marks) = Consolidated CIE marks (for 30 marks) + Consolidated CAA marks (for 10 marks)	40
University Examinations (External)	Once	60
Total		**100**

10. Mapping(X) of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1														X	
CO2	X													X	
CO3	X													X	
CO4	X													X	
CO5	X													X	
CO6	X													X	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	2													1	
CO3	2													1	
CO4	2													1	
CO5	2													1	
CO6	2													1	



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