



Semester: IV				
DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS				
Category: PROFESSIONAL CORE COURSE				
(Theory)				
(Common to CS, IS, CD, AI & CY)				
Course Code	:	CS241AT	CIE	: 100 Marks
Credits: L:T:P	:	3:0:0	SEE	: 100 Marks
Total Hours	:	45L	SEE Duration	: 3 Hours

Unit-I	9 Hrs
Fundamental Principles of Counting and Combinatorics The Rule of Sum and Product, Permutations, Combinations, Principle of Inclusion and Exclusion, Derangements, The Binomial Theorem, Combinations with repetition.	
Recursive Definitions, Recurrence Relations Recursive definition, First order linear recurrence relation- Formulation problems and examples, Second order linear recurrence relations with constant coefficients- Homogeneous and Non homogeneous, Generating functions.	
Unit – II	9 Hrs
Fundamentals of Logic Basic Connectives and Truth Tables, Tautologies, Logical Equivalence: The laws of logic, Logical Implications, Rules of inference. Open Statement, Quantifiers, Definition and the use of Quantifiers, Definitions, and the proofs of theorems.	
Unit –III	9 Hrs
Relations Properties of relations, Composition of Relations, Partial Orders, Hasse Diagrams, Equivalence Relations, and Partitions.	
Functions Functions-plain, One-to-one, onto functions, Stirling numbers of the second kind, Function composition and Inverse function, Growth of function.	
Unit –IV	9 Hrs
Groups theory Definition, Examples and Elementary properties, Abelian groups, Homomorphism isomorphism, cyclic groups, cosets and Lagrange's theorem.	
Coding Theory: Elementary coding theory, the hamming metric, the parity-Check and Generator Matrices	
Unit-V	9 Hrs
Introduction to Graph Theory: Graphs and their basic properties - degree, path, cycle, complement, subgraphs, isomorphism, Computer representations of graphs. Eulerian and Hamiltonian graphs, Graph coloring, Planar graphs.	
Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Spanning trees.	



Course Outcomes: After completing the course, the students will be able to	
CO 1:	Apply the concepts of discrete mathematical structures for effective computation and relating problems in the computer science domain.
CO 2:	Analyze the concepts of discrete mathematics to various fields of computer science.
CO 3:	Design solutions for complex problems using different concepts of discrete mathematical structure as a logical predictable system.
CO 4:	Explore/Develop new innovative ideas to solve some open problems in theoretical computer science.
CO 5:	Effectively communicate, work in groups in order to accomplish a task and engage in continuing professional development.

Reference Books:	
1.	Ralph P. Grimaldi and B V Ramana, Discrete and Combinatorial Mathematics- An Applied Introduction, Pearson Education, Asia, 5 th Edition – 2017, ISBN 978-0321385024
2.	J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata – McGraw Hill, 1 st Edition 2017, ISBN 13:978-0074631133
3.	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata – McGraw Hill, 6 th Edition, 7 edition 2017, ISBN-(13): 978-0070681880

EXPERIENTIAL LEARNING

Based on the concepts learnt in this course like relations, functions- problems on graph theory such as graph coloring, scheduling problems could be given for Experiential learning.

Also using the concepts of logical reasoning and group theory some of the NLP problems could also be given for Experiential learning.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	COMPONENTS	MARKS
1.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks adding up to 20 Marks. THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.	20
2.	TESTS: Students will be evaluated in test consisting of descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO TESTS will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.	40
3.	EXPERIENTIAL LEARNING: Students will be evaluated for their creativity and practical implementation of the problem. Phase I (20) & Phase II (20) ADDING UPTO 40 MARKS.	40
MAXIMUM MARKS FOR THE CIE THEORY		100



RUBRIC FOR SEMESTER END EXAMINATION (THEORY)	
CONTENTS	MARKS
PART A	
Objective type questions covering entire syllabus	20
PART B (Maximum of FOUR Sub-divisions only)	
Unit 1 : (Compulsory)	16
Unit 2 : Question 3 or 4	16
Unit 3 : Question 5 or 6	16
Unit 4 : Question 7 or 8	16
Unit 5: Question 9 or 10	16
TOTAL	100