OLMCA501	Discrete Mathematical Structures	L	T	P	C
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Pre-requisite	**NIL**	**Syllabus Version**			
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Course Objectives :

1. To understand the Mathematical structures required for building logical and computational tools.
2. To use Counting techniques, in particular recurrence relations to solve discrete time problems.
3. To understand the concepts of graph theory and formal languages.

Course Outcomes :

At the end of this course, students will be able to

1. Learn proof techniques and concepts of inference theory.
2. Use number theory in cryptography applications.
3. Counting techniques in discrete time problems.
4. Use lattice and Boolean algebra properties in digital circuits.
5. Solve network optimization problems using Graph theory.
6. Design grammar and finite automata to generate and accept languages.

Module:1	**Mathematical Logic**

Statements and Notation-Connectives–Tautologies-Equivalence - Implications–Normal forms - The Theory of Inference for the Statement Calculus - Predicate Calculus - Inference Theory of the Predicate Calculus.

Module:2	**Number Theory**

Divisibility -division algorithm –Euclidean algorithm- Definitions and basic properties of congruence - Solving linear congruence and quadratic congruence- Chinese remainder theorem, Euler's theorem and Fermat's little theorem.

Module:3	**Counting Techniques**

Basics of counting-Pigeonhole principle- Permutations and combinations-Inclusion-exclusion principle-Recurrence relations-Solving recurrence relations-Generating functions-Solution to recurrence relations.

Module:4	**Lattices and Boolean algebra**

Partially Ordered Relations -Lattices as Posets – Hasse Digram – Properties of Lattices – Boolean algebra-Properties of Boolean Algebra-Boolean functions.

Module:5	**Fundamentals of Graphs**

Basic Concepts of Graph Theory – Planar and Complete graph - Matrix representation of Graphs – Graph Isomorphism – Connectivity–Cut sets-Euler and Hamilton Paths–Shortest Path algorithms.

Module:6	**Trees, Fundamental circuits , Cut sets**

Trees – properties of trees – distance and centres in tree –Spanning trees – Spanning tree algorithms- Tree traversals- Fundamental circuits and cut-sets.

Module:7	**Grammars and Automata**

Alphabets- Strings- Free monoids – Formal Languages- Grammars- Context Free Grammar- Derivation trees- Regular Grammar- Deterministic finite automaton- Non-Deterministic finite automaton-Pushdown Automaton- Turing Machine.

	Total Lecture hours:	**120 hours**
Tutorial	• A minimum of 10 problems to be worked out by students in every Tutorial class. • Another 5 problems per Tutorial Class to be given as home work.	

Text Book(s)	
1. Discrete Mathematical Structures with Applications to Computer Science, J .P. Trembley and R. Manohar, Tata McGraw Hill-35th reprint, 2017. 2. Graph theory with application to Engineering and Computer Science, Narasing Deo, Prentice Hall India 2016.	
Reference Books	
1. Discrete Mathematics and its applications, Kenneth H. Rosen, 8th Edition, Tata McGraw Hill, 2019. 2. Discrete Mathematical Structures, Kolman, R.C.Busby and S.C.Ross, 6th Edition, PHI, 2018. 3. Discrete Mathematics, Richard Johnson baugh, 8th Edition, Prentice Hall, 2017. 4. Discrete Mathematics, S. Lipschutz and M. Lipson, McGraw Hill Education (India) 2017. 5. Elements of Discrete Mathematics–A Computer Oriented Approach, C.L.Liu, Tata McGraw Hill, Special Indian Edition, 2017. 6. Introduction to Graph Theory, D. B. West, 3rd Edition, Prentice-Hall, Englewood Cliffs, NJ, 2015.	
Mode of Evaluation: Quiz / Assignment / Mid-Term, FAT	
Recommended by Board of Studies	11-12-2021
Approved by Academic Council	No. 64 Date 16-12-2021

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