Branch Name:	Computer Engineering/ Information Technology/ Information and Communication technology/ Artificial Intelligence and Data Science
Program Code:	ET103/ ET105/ET107/ET108
Course Name:	Discrete Mathematics
Course Code:	2ET1000301T
Pre-requisite Course:	Basic knowledge of Algebra, Function

Course Objectives:

- To make the students learn the concept of algebraic structures and the comparison between them.
- To make the students understand the graphs and the colourings for specific purposes.
- The course intends to cover the mathematical foundation required for understanding Artificial Intelligence and Data Science with an aim to provide a basic background that will help codify and describe problems in AI and DS.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
					SEE		CCA		SEE		CCA		
	L	T	P	Total	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	3	1	-	4	24	60	16	40	-	-	-	-	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1.	**Algebra:** Algebraic structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation & Quotient Structures, Abelian Group, Cyclic Group, Subgroup, Permutation Groups, Coset Decomposition Of Groups, Normal Subgroups, Lagrange's Theorem.	**14**	**30**
2.	**Propositional Logic:** Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples **Predicate Logic:** Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples	**8**	**18**
3.	**Relations:** Definition, Binary Relation, Representation, Domain, Range, Universal Relation, Void Relation, Union, Intersection, and Complement Operations on Relations, Properties of Binary Relations in a Set: Reflexive, Symmetric, Transitive, Anti-symmetric Relations, Relation Matrix and Graph of a Relation; Partition and Covering of a Set, Equivalence Relation, Equivalence Classes, Compatibility Relation, Maximum Compatibility Block, Composite Relation, Converse of a Relation, Transitive Closure of a Relation R in Set X **Partial Ordering:** Definition, Examples, Simple or Linear Ordering, Totally Ordered Set (Chain), Frequently Used Partially Ordered Relations, Representation of Partially Ordered Sets, Hesse Diagrams, Least & Greatest Members, Minimal & Maximal Members, Least Upper Bound (Supremum), Greatest Lower Bound (infimum), Wellordered Partially Ordered Sets (Posets). Lattice as Posets, complete, distributive modular and complemented lattices Boolean and pseudo Boolean lattices. (Definitions and simple examples only) **Recurrence Relation:** Introduction, Recursion, Recurrence Relation, Solving, Recurrence Relation	**8**	**18**

4.	**Graph Theory:** Basic Concept of Graph and their properties, Degree, , Path, Cycle, Subgraphs, Isomorphism, Reachability and Connectedness, Matrix Representation Of Graphs, Eulerian & Hamiltonian Walks, Graph Colouring, Colouring Maps, Colouring Vertices, Colouring Edges, Trees, Routed trees and Sorting, Weighted trees and Prefixes codes.	**10**	**22**
5.	**Fuzzy sets:** Basic Definitions of Fuzzy sets, Basic Operations on Fuzzy Sets, Image and Inverse Images, I- V Fuzzy Sets, Fuzzy Relations.	**5**	**11**

Text Books:

1. Discrete Mathematical Structures with Application to Computer Science By Tremblay, J.P. & Manohar, Mcgraw Hill - New Delhi Textbook of engineering mathematics By A.B.Mathur and V.P.Jaggi.
2. Discrete Mathematics and Its Applications By Rosen, Kenneth McGraw Hill - New Delhi.
3. Fuzzy Sets and Fuzzy Logic. Theory and Applications By George J. Klir/Bo Yuan

Reference Books:

1. Discrete Mathematical Structures For Computer Science By Kolman, B& Busby R.C,Prentice Hall Of India Pvt Ltd., New Delhi.
2. Applied Discrete Structures for Computer Science By Alan Doerr & Kenneth, Galgotia Pub. Pvt Ltd., New Delhi.

List of Open Sources/Learning websites:

1. https://nptel.ac.in/

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the algebraic structures of a given set endowed with one or two binary operations.	L1- Remember L2 -Understand
CLO2	Prove logical equivalency, contingency, tautology, and contradictions.	L2 –Understand L3-Apply
CLO3	Understand relations and functions and apply basic operations and algorithms on them.	L1- Remember L2 –Understand L3-Apply
CLO4	Define how graphs can be used to represent and solve standard problems.	L1- Remember L2 –Understand L3-Apply L4-Analyze
CLO5	Understand and apply the concept of colourings. Know some fundamentals of fuzzy sets.	L1- Remember L2 –Understand L5-Evaluate

Mapping of CLOs with Po's &PSO's

Course Learning Outcomes	Program Outcomes(POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	M			L											
CLO2	M	M			L											
CLO3	M	M	L		M											
CLO4	M	M	M		M											
CLO5	M	M	M		M											

H: High, M: Medium, L: Low