MAT1016	Applied Discrete Mathematical Structures	L	T	P	J	C
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Pre-requisite	None	Syllabus Version				
		1.1				

Course Objectives:

1. The aim of this course is to motivate the learners for understanding the fundamental concepts in discrete mathematics required for software engineering such as sets, functions, sequences, computing techniques, mathematical logics, proof techniques, graph theoretical approaches, relations, recurrence equations and new structured types.
2. On completion of this course, the students are expected to implement the learned discrete mathematical ideas in realistic projects of software technology, theoretical computer skills, computer algorithms, networks and data structures.

Expected Course Outcome

1. know the basic properties and operations of sets, sequences and also apply the basic principles of counting, permutations and combinations for realistic problems
2. recognize the Boolean logic through the truth tables and also prove the results by direct, indirect methods and by mathematical induction
3. learn the basic concepts of graphs, shortest path algorithms, concepts of trees and minimum spanning tree algorithms
4. analyse the various relations and also solve the recurrence equations
5. understand the concepts of structured types, three-valued logic and binary trees.Vector calculus with physical understanding to deal with subjects such as fluid dynamics

Student Learning Outcomes (SLO)	1,2,7

Module:1	Sets, Sequences and Counting	7 hours

Operations on Sets and Cardinality – The Pigeonhole Principle – Sequences – The Characteristic Sequence of a Subset – Counting – Number of k-Sequences on an n-Set – Number of k-Permutations on an n-Set – Number of k-Subsets of an n-Set.

Module:2	Boolean Expressions, Logic and Proof	7 hours

Boolean Expressions and Truth Tables – Predicates and Quantifiers – Valid Arguments – Direct and Indirect Proofs – Mathematical Induction.

Module:3	Graphs	7 hours

Basic Terminology of Graphs – Special Graphs – The Concept of Degree – Paths – Circuits – Connectedness – Euler and Hamiltonian Circuits – Matrix Representations of Graphs – Graph Isomorphism – Isomorphic Invariants – Shortest Path Problem.

Module:4	**Trees**	**6 hours**
Definition of Trees – Characterizing Trees – Rooted and Binary Trees and Their Properties – Spanning Tree – Minimum Spanning Trees.		
Module:5	**Relations**	**6 hours**
Relations – Matrix and Digraph of a Relation – Properties of Relations – Order Relations – Matrix and Digraph of a Partial Order – Minimal and Maximal Elements – Relations on Finite and Infinite Sequences.		
Module:6	**Recurrence Equations and Series**	**5 hours**
Recurrence Equations – Solving First Order Linear Recurrence Equations – Solving Second Order Linear Recurrence Equations – Infinite Series – Zeno's Paradoxes.		
Module:7	**Defining New Structured Types**	**5 hours**
Simple Enumerated Types – More Elaborate Types – Self-Referential Types – Parameterized Types – Reasoning About New Types – Three-Valued Logic – Processing Data – Lists – Binary Trees.		
Module:8	**Contemporary Issues**	**2 hours**
Industry Expert Lecture		
	Total Lecture hours:	**45 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. **Mode:** Individual Exercises, Team Exercises, Online Quizzes, Online, Discussion Forums	**30 hours**

Text Book(s)

1. Mathematics of Discrete Structures for Computer Science, Gordan J. Pace, Springer-Verlag , 2012.
2. Fundamentals of Discrete Math for Computer Science: A Problem-Solving Primer, Tom Jenkyns and Ben Stephenson, Springer-Verlag, 2013.

Reference Books

1. Discrete Mathematics with Applications, Susanna S. Epp, Fourth Edition, BROOKS/COLET, 2010.
2. Discrete Mathematical Structures with Applications to Computer Science, J.P. Trembley

	and R. Manohar, Tata McGraw Hill, 35th Reprint, 2008. 3. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, Tata McGraw Hill, 2012. 4. Discrete Mathematical Structures, Kolman, R.C. Busby and S.C. Ross, 6th Edition, PHI, 2009. 5. Discrete Mathematics, Richard Johnsonbaugh, 8th Edition, Prentice Hall, 2017. 6. Discrete Mathematics, S. Lipschutz and M. Lipson, McGraw Hill Education (India), 2013. 7. Narasing Deo, Graph theory with application to Engineering and Computer Science, Prentice Hall India 2014.

Mode of Evaluation			
Digital Assignments, Quiz, Continuous Assessments, Final Assessment Test			
Recommended by Board of Studies	16. 08. 2017		
Approved by Academic Council	No. 47th	Date	05.10.2017