Course code	Course Name	L-T-P - Credits	Year of Introduction
RLMCA103	Discrete Mathematics	3-1-0-4	2016

Course Objectives

- To give an understanding of important mathematical concepts together with a sense of why these concepts are important for computer science.
- To provide a foundation of set theory, Congruences, Counting techniques and Graph theory

Syllabus

Logic, Sets, Relations, Functions, Division algorithm, Congruences, Counting techniques, Advanced Counting Techniques, Graphs and Graph Models.

Expected Outcome

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.

References

1. C. Liu, "Elements of Discrete Mathematics: A Computer Oriented Approach", McGraw-Hill, 4th Edition (2012).
2. David M. Burton, "Elementary Number Theory", McGraw-Hill, 7th Edition (2012).
3. Jean-Paul Tremblay , "Discrete Mathematical Structures with applications to Computer science", ", McGraw-Hill, 1st Edition (2001).
4. Joe R. Mott, Abraham Kandel, Theodore P Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", Pearson Education, 2nd Edition (2015)
5. Kenneth H. Rosen , "Discrete mathematics and its applications", McGraw-Hill, (7th Edition), (Smartbook available).
6. Marty Lewinter, Jeanine Meyer, "Elementary Number Theory with Programming", Wiley- Blackwell (2015).
7. R.K Bisht and H.S Dhami, "Discrete Mathematics ", Oxford University Press, 1st Edition (2015)
8. Ralph P Grimaldi, "Discrete and Computational Mathematics: An applied introduction", Pearson Education, 5th Edition, (2007).
9. Swapan Kumar Chakroborthy ,Bikash Kanthi Sarkar, "Discrete Mathematics ", Oxford University Press (2010).
10. Y.N. Singh, "Discrete Mathematical Structures ", Wiley India Pvt. Ltd (2010)

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Basic Structures** - Sets, Set Operations, Relations, Classification of relations, Equivalence Relations, Closures of Relations, Matrix Representation of Relations, Partial Ordering, n-ary Relations, Functions. **Relevant Portions from Text 2 primarily and Text 1 for additional reference**	9	15%
II	Division Algorithm, GCD, Primes, Euclidean Algorithm, Congruences, Properties of Congruences, Solutions of Linear Congruences, Chinese Remainder Theorem. **Text 3: 2.2, 2.3, 2.4, 4.2, 4.4 and Text 1 for additional reference**	9	15%

FIRST INTERNAL EXAMINATION			
III	Permutations, Circular Permutations, Combinations, Combinations with repetition, Binomial Theorem, Pigeonhole Principle, Principle of Inclusion and exclusion **Text 4: 1.2, 1.3, 5.5, 8.1 and Text 1 for additional reference**	9	15%
IV	Generalization of Principle of Inclusion and Exclusion, First Order Linear Recurrence Relation, Second Order Linear homogeneous Recurrence Relations with Constant coefficients, Non Homogeneous Recurrence Relation, Divide-and-Conquer Algorithms and Recurrence Relations **Text 4: 8.3, 10.1, 10.2, 10.3 and Text 1 for additional reference**	9	15%
V	Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring Graphs, Directed Graph, Multigraph, Connected graph, Graph Isomorphism, Euler circuit and trail, Fleury's Algorithm, Planar and NonPlanar Graphs, Bipartite Graph, Kuratowski's Theorem(without proof), Cut-set, Hamiton path and cycle. **Text 4: 11.1, 11.2, 11.3, 11.4, 11.5 and Text 1 for additional reference** **(proof of theorems 11.6, 11.8 and 11.9 are not required)**	10	20%
SECOND INTERNAL EXAMINATION			
VI	**Logic** - Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of inference. **Text 1**	10	20%
END SEMESTER EXAM			
QUESTION PAPER PATTERN			
There will be two parts in the Question paper - **Part A and Part B.** **Part A** will have 8 short answer questions of 3 marks each (8 X 3 M = 24 M). There will be no choice questions. **Part B** will have 6 essay questions one from each module of 6 marks each, with an alternative choice question from the same module (6 x 6M=36M). The maximum number of sub part questions in **Part B** to be limited to 2. The total marks assigned to questions in Part A (Short answer) and Part B (Essay) together from a single module will not exceed the marks assigned to that module specified in the course plan.			