DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES

MA714
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

COURSE INSTRUCTOR: DR. JANAKIRAMAN B
FACULTY
DEPT. OF M.A.C.S.

Course Plan and Evaluation Plan

1 Course Content

Combinatorics: Fundamental principles of counting, Pigeonhole principle, Countable and Uncountable sets, Principle of Inclusion and Exclusion, Derangements, Generating functions, Recurrence relations, Solution of recurrences using Generating functions.
Graph Theory: Graph Representations, Directed and Undirected graphs - Introduction and basic properties, Subgraphs, Isomorphism, Eulerian and Hamiltonian graphs, Trees, Spanning Trees, Weighted Trees, Connectivity, Planar graphs, Euler's formula, Applications of Kuratowski's theorem, Graph Colouring, Chromatic polynomials.
Group Theory: Groups and subgroups, Homomorphism theorems, Permutation groups, Normal subgroups, Cosets, Lagrange's Theorem, Rings.

2 Course Plan

2.1 Objective of the Course

To expose the students to the fundamentals of Combinatorics, Graph Theory, and Group Theory, and to introduce the applications to Computer Science.

2.2 Skill Development of the student expected from the course

The student should be able to analyze the problem, translate into relevant model and find a solution.

2.3 Course Coverage (in stages)

Combinatorics	14 hours
Graph Theory	14 hours
Group Theory	12 hours

Note: *The durations specified as "hours" are not precisely hours; rather it means, there will be so many presentations. Furthermore, the number of hours is a tentative value, which depends on the discussions that take place.*

3 Evaluation Plan

Evaluation Plan is based on continuous evaluation system. There will be mainly three types of evaluation:

1. Quizzes and Assignments: 25%
2. Mid Semester Examination: 25%
3. End Semester Examination: 50%

Further, the overall evaluation is relative basis. It means that each one of you will be compared in overall performance with the others.

4 Reference Materials

1. Kenneth H Rosen, *Discrete Mathematics and its applications with Combinatorics and Graph Theory*, 7th Edition, McGraw Hill Education, 2012.

2. Douglas B West, *Introduction to Graph Theory*, 2nd Edition, Eastern Economy Edition, Pearson, 2015.

3. Grimaldi, R.P., Ramana B.V., *Discrete and Combinatorial Mathematics: An Applied Introduction*, Pearson, 2006.

4. Kolman, B. and Busby, Ross S.C., *Discrete Mathematical Structures for Computer Science*, Pearson, 2015.

Note: *The above list is not exhaustive! More references (books/ articles/ soft copies/ weblinks etc.) will be shared with you as the course progresses.*