

**Addis Ababa science & Technology University**

**College of Natural and Social Sciences**

**Department of Mathematics**

**Discrete mathematics-I Course outline**

**Course Title:** Discrete mathematics-1

**Course Code:** Math 191

**Credit hours:** **3 Lecture hours:** **2**  **Tutorial hours: 3**

**Course category:** Compulsory

**Aims:** The course setsthe necessary background for students to understand the subsequent application area courses such as probability, network, etc

**Course description**

This course deals with review of sets and functions, fundamental principles of counting, Elementary probability theory, recurrence relations and graph theory

**Course Objectives:**

On completion of the course, successful students will be able to:

* Know basic concepts of discrete mathematics
* Understand the principles of counting, recurrence relations and probability theory
* Understand the basic concepts of graph and their types
* Know the basic algorithm on graphs
* Use the methods and principles of combinatorics
* Apply combinatorics in counting problems
* Apply graph theory to solve network oriented problems

**Chapter 1: Elementary counting principles**

1.1Basic counting principle

1.2 Permutations and Combinations

1.3 The inclusion-exclusion principles

1.4 The pigeonhole principle

1.5 The binomial theorem

**Chapter 2: Elementary probability theory**

2.1 Sample space and events

2.2 Probability of an event

2.3 Conditional probability

2.4 Independent events

2.5 Random variables and expectation

**Chapter 3**: **Recurrence relations**

3.1 Definition and Examples

3.2 Linear recurrence relations with constant coefficient

3.3 Solutions of linear recurrence relations

3.4 Solutions of homogeneous and non-homogeneous recurrence relations

**Chapter 4:** **Elements of graph theory**

4.1 Definition and examples of a graph

4.2 Matrix representation of a graph

4.3 Isomorphic graphs

4.4 Path and connectivity of a graph

4.5 Common graphs(complete, regular, Eulerian, Hamiltonian, planar graph, trees and forests)

4.6 Graph coloring

**Chapter 5: Directed graphs**

5.1 Definition and examples of digraphs

5.2 Matrix representation of digraphs

5.3 Paths and connectivity

**Chapter 6: Weighted graphs and their applications**

6.1 Weighted Graphs

6.2 Minimal Spanning trees

6.3 Shortest path problem

**Teaching-learning methods:**

Three contact hours of lectures and two hours of tutorials per week. Students do home assignments

**Assessment methods:** Continuous assessment **…50%**

Final examination**… 50%**

**Text books:** Rozen, Discrete mathematics and its application

**Reference books:**

1. Lipschutz, S, Schaum’s outline series ,Discrete Mathematics
2. Iyengar,S.R , Elements of Discrete Mathematics