Introduction To Discrete Mathematical Structures

CSE, SEAS
Bennett University

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Overview

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What is Discrete Mathematics?

Discrete Mathematics, also called Finite Mathematics, is the study of mathematical structures that are fundamentally discrete in the sense that its objects can assume only distinct separate values, rather than in a range of values.

It is increasingly being applied in the practical fields of mathematics and computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Types of Mathematics: Mathematics can be broadly classified into two categories :

- ▶ Continuous Mathematics
- ▶ Discrete Mathematics

Continuous Mathematics is based upon continuous number line or the real numbers. It is characterized by the fact that between any two numbers, there are almost always an infinite set of numbers. For example, a function in continuous mathematics can be plotted in a smooth curve without breaks.

Discrete Mathematics, on the other hand, involves distinct values; i.e. between any two points, there are a countable number of points. For example, if we have a finite set of objects, the function can be defined as a list of ordered pairs having these objects, and can be presented as a complete list of those pairs.

Why study Discrete Mathematics?

- ▶ To develop mathematical maturity: that is , your ability to understand and create mathematical arguments.

- ▶ It helps to understand other subjects in CS.

- ▶ Main aim is to think in mathematical manner.

Application Areas

Areas in which discrete mathematics concepts are applied :

- ▶ Formal Languages (computer languages)
- ▶ Compiler Design
- ▶ Data Structures
- ▶ Computability
- ▶ Automata Theory
- ▶ Algorithm Design
- ▶ Relational Database Theory
- ▶ Complexity Theory (counting)

COURSE TITLE	Discrete Mathematical Structures	Prerequisites	NA
COURSE CODE	ECSE209L	TOTAL CREDITS	4
COURSE TYPE	Core	L-T-P Format	3-1-0

Topics to be covered

1. Logic

2. Sets

3. Relations

4. Functions

5. The Fundamentals: Algorithms, Integers

6. Counting

7. Algebraic Structures

8. Graphs

9. Trees

Evaluation Policy

Components of Course Evaluation	Percentage
Mid Term Examination	20
End Term Examination	35
Assignment	05
Quiz	30
Continuous Evaluation	10

Textbooks and References

TEXTBOOKS/LEARNING RESOURCES:

- ▶ Bisht, R.K. and Dhami, H.S., Discrete Mathematics (1st ed.), Oxford University Press, 2015. ISBN 978-0199452798.

- ▶ O'Donnell, J., Hall, C. and Page, R., Discrete Mathematics Using a Computer (2nd ed.), Springer - International, 2006. ISBN 978-1846282416.

- ▶ Rosen, Kenneth H., and Kamala Krithivasan. Discrete mathematics and its applications: with combinatorics and graph theory. Tata McGraw-Hill Education, 2012.

- ▶ Liu, Chung Laung. Elements of discrete mathematics. Tata McGraw-Hill Education, 1986.

REFERENCE BOOKS/LEARNING RESOURCES:

- ▶ Biggs, N.L., Discrete mathematics (2nd ed.), Oxford University Press, 2002. ISBN 978-0198507178.

- ▶ https://www.coursera.org/learn/discrete-mathematics