

Guidelines for B.Sc. (H) Computer Science Semester II (NEP UGCF 2022)**Discrete Mathematical Structures
DSC05**

(Effective from Academic Year 2024-25)

S. No.	Topic	Reference	Contents	Hours
1	Unit 1 - Sets, Relations and Functions	[2]	2.1 (upto example 21), 2.2, 2.3, 2.4: 2.4.1, 2.4.2, 2.4.5 8.5 9.1, 9.3: 9.3.1, 9.3.2, 9.4: 9.4.1, 9.4.2, 9.4.3, 9.4.4, 9.5: 9.5.1, 9.5.2, 9.6: 9.6.1, 9.6.2, 9.6.3	7
2	Unit 2 - Logic and Proofs	[2]	1.1, 1.2, 1.3 (upto 1.3.5), 1.4 (upto 1.4.3), 1.6 (upto 1.6.6), 1.7 5.1: 5.1.1 to 5.1.7 (upto page 343)	11
3	Unit 3 - Number Theory	[2]	4.1, 4.2, 4.3: 4.3.1, 4.3.2, 4.3.3, 4.3.6, 4.3.7	7
4	Unit 4 - Combinatorics	[1] [2]	2.1 to 2.4 6.2 (upto 6.2.1)	5
5	Unit 5 - Graphs and Trees	[2]	10.1 (upto page 676), 10.2: 10.2.1, 10.2.2, 10.2.3, 10.3 (excluding algorithms and application of isomorphism), 10.4: 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.5: 10.5.1, 10.5.2, 10.5.3, 10.6: 10.6.1, 10.7: 10.7.1, 10.7.2 11.1: 11.1.1, 11.1.3: Theorem 2 only with proof	10
6	Unit 6 - Recurrences	[1]	8.1, 8.2 9.1, 9.2, 9.3	5

Note:

1. Exclude proofs of theorems, lemmas and corollaries.
2. Guidelines have been prepared according to soft copy of reference [2].
3. Practical implementation to be done in either Python or C++.

References

1. Liu, C.L., Mohapatra, D.P. Elements of Discrete Mathematics: A Computer Oriented Approach, 4th edition, Tata McGraw Hill, 2017.
2. Rosen, K.H., Discrete Mathematics and Its Applications, 8th edition (soft copy), Mc Graw Hill, 2018.

Practical List

1. Create a class SET. Create member functions to perform the following SET operations:
 - a. is member: check whether an element belongs to the set or not and return value as true/false.
 - b. powerset: list all the elements of the power set of a set.
 - c. subset: check whether one set is a subset of the other or not.
 - d. union and intersection of two Sets.
 - e. complement: assume universal set as per the input elements from the user.
 - f. set difference and symmetric difference between two sets.
 - g. cartesian product of sets.

Write a menu driven program to perform the above functions on an instance of the SET class.

2. Create a class RELATION, use Matrix notation to represent a relation. Include member functions to check if the relation is Reflexive, Symmetric, Anti-symmetric, Transitive. Using these functions check whether the given relation is: Equivalence or Partial Order relation or None
3. Write a Program that generates all the permutations of a given set of digits, with or without repetition.
4. For any number n , write a program to list all the solutions of the equation $x_1 + x_2 + x_3 + \dots + x_n = C$, where C is a constant ($C \leq 10$) and $x_1, x_2, x_3, \dots, x_n$ are nonnegative integers, using brute force strategy.
5. Write a Program to evaluate a polynomial function. (For example store $f(x) = 4n^2 + 2n + 9$ in an array and for a given value of n , say $n = 5$, compute the value of $f(n)$).
6. Write a Program to check if a given graph is a complete graph. Represent the graph using the Adjacency Matrix representation.
7. Write a Program to accept a directed graph G and compute the in-degree and outdegree of each vertex.