Course Title: Discrete Mathematics
Nature of the Course: Theoretical
Course No. : Math Ed. 475 (Minor)

Teaching Hours: 48
Credit Hours: 3
Level: B Ed/ Semester: VII

1. Course Description

This course is designed for the B .Ed. (ICT) students needed to explore mathematical structures in the objects and understand their properties. This course covers the basic notions and results on relations, counting and combinatories, algorithms, recursion and sequences, special functions and transformations that are universally needed. Further, it has incorporated learners' experiences closer to IT-applications, different examples, problems and projects.

2. The General Objectives

The general objectives of this course are as follows:

- To familiarize students with theoretical concepts of relation and special types of function.
- To understand the theoretical concept of algorithm.
- To develop the ability to perform the basic algorithms applicable in the computer work.
- To make students efficient of solving the problems of sequence and series.
- To enable the students in dealing with principle of counting and combinatories
- To familiarize learners' concept of isometric and non - isometric transformations.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define Cartesian product of two and three sets. • Define different types of relations and find the relations between different sets. • Represent the given relations in different methods. • Verify the different properties of relations • Define Boolean matrix with examples.	**Unit- I Relations and Digraph (9 hrs)** 1.1 Product set and partitions 1.2 Binary relations and its types 1.3 Different methods representing relations. • Relation as an order pairs • Relations as matrix • Relations as directed graphs • Relations as an arrow diagram • Relations as graph 1.4 Properties of relations:

• Perform the operations on Boolean matrices. • Perform the product of two Boolean matrices. • Find the composition of two relations. • Find the operation on relations with transitive closure and Warshall's algorithm	• Reflexive, • Symmetric • Asymmetric • Transitive • Equivalence relation • Partial order relations 1.5 Boolean matrix representation of Relations • Boolean matrix operation • Boolean products 1.6 Composition of two relations 1.7 Operation on relations 1.8 Transitive closure and Warshall's algorithm
• Define basic principle of counting • Use sum and product rule principle to find the total number of arrangement of objects. • Explain the method of Permutation and find the permutation of n different object. • Define combinations and find the combination of different objects. • Prove Pigeonhole principle and find the number of pigeons and pigeonholes. • Prove extended pigeonhole principle and find the number of pigeons and pigeonholes.	**Unit II Counting and Combinatories (7 hrs)** 2.1.Introduction 2.2 Basic principles of counting • Sum rule principle • Product rule principle 2.3 Permutation of n- different objects 2.4 Combination 2.5 The pigeonhole principle 2.6 The extended pigeonhole principle
• Define fundamental of different algorithm on the integers and matrices • Define different types of complexity. • Use binary and linear search to find the numbers in the list. • Use Bubble sort and insertion sort to find the element in the list.	**Unit III The Fundamental Algorithms, and Matrices (9 hrs)** 3.1 Algorithms 3.2 Complexity of algorithm • Time complexity • Understanding the Complexity of algorithm. 3.3 Searching algorithm: • Linear search • Binary search

• Define matrices and its types • Find transpose of matrices and power of matrices	3.4 Sorting • Bubble sort • Insertion sort 3.5 Matrices • Matrix arithmetic • Transpose of matrix • Power of matrices
• Find the n^{th} term of sequence by using recursive formula. • Use summation notation for the given sequences. • Define recurrence relations with examples. • Solve the recursive relations. • Identify the recursively defined functions and use it to find the term of sequences.	**Unit- IV Recursion on Sequence and Series (8 hrs)** 4.1 Introduction 4.2 Sequence and summations • Arithmetic progression • Geometric progression • Harmonic progression • Relations and properties • Recurrence relations • Use of series on summation notation 4.3 Solutions for recursive relations 4.4 Recursive algorithm, recursion and iteration, the merge sort. 4.5 Recursively defined functions
• Define floor and ceiling functions with examples. • Define characteristics function, recursive function, integer value functions remainder functions, factorial function and permutation functions with examples. • Find the value of factorial function	**Unit : V Special Types of Functions (6 hrs)** 5.1 Floor and ceiling function 5.2 Characteristics functions 5.3 Integer value functions 5.4 Remainder function: modular arithmetic 5.5 Factorial function
• Define isometric and Non- Isometric transformation with examples	**Unit- VI Geometric Transformation (9 hrs)** 6.1 Geometric properties of plane linear transformation

• Apply the isometric and non isometric transformation to solve numerical examples. • Represent Isometric and Non-isometric transformation in matrices. .	6.2 Isometric transformation • Reflection • Translation • Half turn • Rotation • Glide Reflection 6.3 Non isometric transformation • Dilation • Stretch • Shear 6.4 Matrix representation of isometric and non- isometric transformations

4. Instructional Techniques:

4.1 General Instructional Techniques

Diffent instructional techniques lecture, power point presentation, questions-answer, collaborative work etc along with the use of animated figures, use of mathematical softwares can be applied.

4.2 Specific Instructional Techniques

The specific instructional techniques for this chapter wise are as follows:

Unit- I	Discussion and presentations in groups, mini lecture
Unit- II	Discussion and presentation, brain storming
Unit- II	Presentation and verification in group, demonstration
Unit-III	Collaborative problem solving and verification
Unit-IV	Power point presentation and verification in computer
Unit-V	Lecture, problem solving, questions –answers, and discussion
Unit-VI	Assignment and discussion

5. Evaluation

Internal Evaluation: 40%

The subject teacher will conduct internal evaluation as follows:

• Attendance	5 points
• Participation in learning activities	5 points
• Group works and presentation	5 points
• Second project work /assignment	10 points
• Third assignment	10 points
• Unit test and midterm examination	5 points
Total :	**40 points**

External Evaluation (Final Examination) 60%

Examination Division, Dean's Office will conduct final examination at the end of the semester. The types of questions and marks allocated for each category of questions are given below:

- Objective type question (10 × 1point) = 10 points
- Short answer questions (6 × 5 points) = 30 points
- Long answer questions (2 × 10 points) = 20 points

Total = 60 points

6. Recommended and Reference Books

6.1 Recommended Books

Rosen H.K ,(2008) *Discrete mathematics and its application*, 7th Edition, Mc Graw Hill Companies.

Susanna S.E (2011)*Discrete mathematics with application,* (Fourth Edition), Cangage Learning

6.2 Reference Books

Johnsonbaugh, R. (2002) *Discrete mathematics* (5th Edition). Singapore: Pearson Education Pvt. Ltd, India (Branch Office, Delhi).

Kolman, B, Busby,R.C, Ross,Sc (2009). *Discrete mathematics and its structures* (6th Edition). Delhi: PHI learning Pvt.Ltd.

Maskey S.M, Ghimire S.P. & Jha J.N. (2071). *Discrete mathematics with application*, Kathmandu : Pinnacle Publication.