Course Title : Mathematics-I   **Nature of Course : Theory**

Level : BICTE   **Teaching Hours: 48**

Code Number : Math Ed. 415   **Full Marks: 100**

Semester : First   **Credit Hours : 3**

1. **Course Introduction**

This is an integrated course of different branches of mathematics for the students at bachelor's degree students of Information and Communication Technology(BICTE). This course provides a foundation for the students to understand the basic concept of mathematics to be applicable in the field of technology.. This course starts from the very fundamental matters of set and logic which help to understand various concepts of mathematics. Furthermore, it introduces real number system to make students familiar with real number system and its properties without which mathematical study is not complete . This course also enables to develop skills of drawing graphs of different types of functions that help to understand mathematics through figures . Finally, it discusses on sequence , series and logarithms through subsequent units which provide necessary concepts of basic mathematics to be applicable in the field of information and communication technology.

2. **General Objectives**

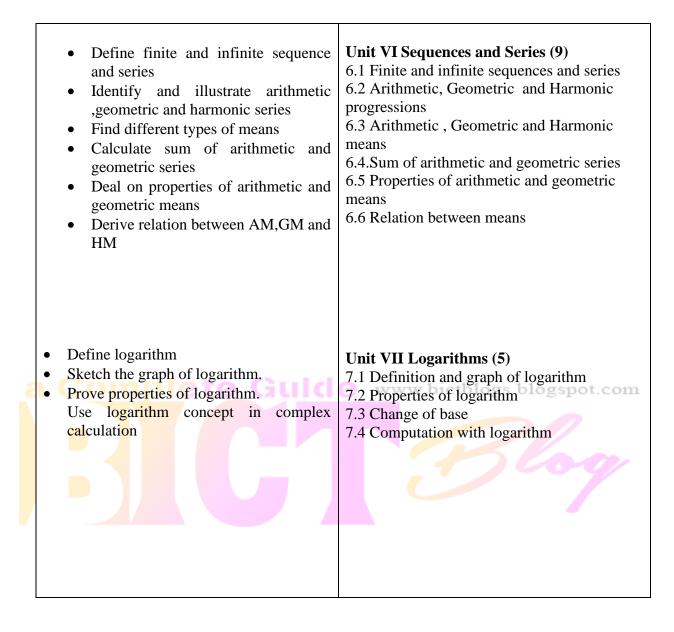The general objectives of this course are as follows:

- To familiarize the students with the basic concepts and operations of set theory.
- To enhance the knowledge of the logic to test validity of the arguments.
- To acquire the concept of real number system.
- To inculcate the skills of drawing graphs of functions and inequalities.
- To develop an skill of solving quadratic equations and deal on the relation between roots
- To familiarize students with sequence and series
- .To acquire a knowledge of logarithm and its properties

3. Specific Objectives and Contents
 Specific objectives to each unit and corresponding contents are described below:

- Define sets and their types with examples. - Identify and illustrate sets and their subsets - Explain the relation of sets and subsets - Perform basic set operations with examples - Find cardinal number of sets. - Prove algebra of sets and illustrate with examples. Represent sets in Euler-Venn-diagrams.	**Unit I Sets (6)** 1.1.Sets and their types 1.2.Relation of sets and representation 1.3Operations on sets with their properties 1.4.Cardinal number of sets 1.5.Algebra of sets 1.6. Euler – Venn diagram of sets
- Define statements and their truth values - Identify connectives and make compound statements - Construct negation of different types of statements - Draw truth values of compound statements - Identify tautology of statements - Construct validity of arguments.	**Unit II Symbolic Logic(5)** 2.1 Statements 2.2 Compound statements and their truth values 2.3 Logical connectives 2.4. Algebra of statements 2.5 Equivalent statements 2.6 Conditional and bi-conditional statements 2.7 Tautology and contradictions 2.8 Arguments and the test of their validity

- Identify the system of natural numbers ,whole numbers and integers - Describe the axioms of Peano on natural numbers - Define rational and irrational numbers - Plot rational and irrational numbers in graph - Deal with addition ,multiplication and distributive properties of real numbers - To define order density properties of real numbers - Explain absolute and non-absolute values of real numbers	**Unit III Real Number System (7)**
	   2.1 Natural numbers ,whole numbers and integers
	   2.2 Peano's axioms of natural numbers
	   2.3 Rational and irrational numbers
	   2.4 Construction of rational and irrational numbers in a real line
	   2.5 Real numbers and its properties : - Addition property - Multiplication property - Distributive property - Density property 2.5 Absolute value of real numbers

• Define order pair ,Cartesian product and relation
• Define and identify the types of mapping
• Define and illustrate function its domain ,range and co-domain
• Find composite and inverse of functions
• Identify algebraic and transcendental functions
• Draw graph of quadratic functions ,y=$\sqrt{x}$ and homogeneous equations of first degree
    sDifferentiate between the equation and inequality
• Solve linear and quadratic equations
• Solve equations reducible to linear and quadratic forms
• Solve system of linear equations in two variables
• Solve inequalities and their properties.
• Draw graph of inequalities of two variables
• Solve linear programming problems by g
	Unit IV Functions and Graphs (6)
	1.Order pair , Cartesian product and relation
	2. Mapping and its types
	    • One to one
	    • Onto
	    • One to one and onto
	3.Function :
	    • Domain ,
	    • Range
	    • Co-domain
	4. Composite and inverse functions
	5.Algebraic and transcendental functions
	6. Functions and their graphs
	    • General form of quadratic equations and its graph
	    • Graph of function y=$\sqrt{x}$
	    • System of homogeneous equations and their graph

• Distinguish between equations and inequalities • Identify linear and quadratic equations • Solve linear and quadratic equations • Define homogeneous equations of two variables of first degree • Define inequalities • State properties of inequalities • Draw graph of inequalities of one and two variables • Draw graph of quadratic function • Find the solution set of inequalities of two variables • Solve linear programming problems by graphical method	**Unit V Equations and Inequalities (10)** 5.1 Introduction to equation and inequalities 5.2 Roots of linear and quadratic equations 5.3 Roots of linear and quadratic inequalities of one variable 5.4 System of first degree equations of two variables 5.5 Inequalities and their properties 5.6 Graph of inequalities of one and two variables and their solution set 5.7 Graph of quadratic function 5.8 Solution of linear programming problems by graphical method

• Define finite and infinite sequence and series • Identify and illustrate arithmetic, geometric and harmonic series • Find different types of means • Calculate sum of arithmetic and geometric series • Deal on properties of arithmetic and geometric means • Derive relation between AM,GM and HM	**Unit VI Sequences and Series (9)** 6.1 Finite and infinite sequences and series 6.2 Arithmetic, Geometric and Harmonic progressions 6.3 Arithmetic , Geometric and Harmonic means 6.4.Sum of arithmetic and geometric series 6.5 Properties of arithmetic and geometric means 6.6 Relation between means
• Define logarithm • Sketch the graph of logarithm. • Prove properties of logarithm. Use logarithm concept in complex calculation	**Unit VII Logarithms (5)** 7.1 Definition and graph of logarithm 7.2 Properties of logarithm 7.3 Change of base 7.4 Computation with logarithm

4. Instructional Techniques

4.1General Instructional Techniques:There are various techniques of teaching and learning so as to grasp the knowledge of mathematics. Although the methods of teaching and learning may differ, the techniques to be used are lecture, discussion, problem solving, inquiry, question answer, demonstration ,collaborative teaching approach and problem solving method.

4.2 Specific Instructional Techniques

The specific teaching and learning techniques (unit - wise)are listed below:

Units	Activities and Instructional Techniques	Teaching Hours (48)
Sets	Discussion and sharing experiences	6
Logic	Project work in group	5
Real Number System	Problem based learning in group	7
Functions and Graphs	Question answer and discussion in group	6
Equations and inequalities	Assignment and discussion	10
Sequence and series	Project work in group and individual and problem solving	9
Logarithm	Discussion and problem solving	5

5. Evaluation

5.1   Internal Evaluation: (40%)

Internal evaluation will be conducted by subject teacher based on the following aspects:

- Attendance   5 marks
- Participation in learning activities   5 marks
- First assignment   10 marks
- Second assignment   10 marks
- Third assignment   10 marks

  Total   40 marks

5.2 External Evaluation   (60%)

The examination section of Dean Office , Faculty of Education will conduct final examination at the end of the first semester .The type of questions and marks allocated for each question will be as follows :

- Objective questions (multiple choice)   10 x 1 mark   =   10 marks
  - Short answer questions (with two or) 6 x 5 marks   =   30 marks
  - Long answer questions (with 1 or)   2 x 10 marks   =   20 marks

  Total   =   60 marks

6. Reference Book s

Bajracharya P. M, Basnet G. B., & Phulara, K. R.(2012) *Fundamentals of mathematics*. Kathmandu: Buddha Academic Publishers & Distributors Pvt Ltd.

Baranov I, Bogatyrev G & Bokovner O.(1985). *Mathematics for pre-college students*, Moscow: Mir Publishers

Bajracharya P., Basnet G.B. and Phulara K.R.(2011).*Fundamentals of mathematics* . Kathmandu : Buddha Academic Publishers and Distributers Pvt Ltd

Das, B.C. & Mukherjee B.N. (1984). *Higher trigonometry*. Calcutta: UN Dhur and Sons.

Ganguli, S.M &Mukh:erjee, B.N. (1993). *Intermediate algebra*. Calcutta: UN Dhur and Sons Pvt Ltd.

Pandit, R. P (2004) *Modern mathematics*. Kathmandu: Mrs Indira Pandit shantinagar.

Sarkar, S.K. (2013). A Textbook of *Descrete mathematics*. New Delhi: S Chand & Company Ltd Ramnagar.

Shrestha, R.M.&Bajracharya, S. (2062 B.S.). *Elementary modern linear algebra*. Kathmandu: SukundaPustakBhawan.