**Course Title: Fundamentals of Mathematics Nature of Course: Theory**

**Course No.: Math Ed. 415 Credit Hours: 3**

**Level: B. Ed (Minor Math) Teaching Hours: 48**

**Semester: First**

# Course Description

This is an integrated course of various branches of mathematics for beginner students at the undergraduate level. This course also provides mathematical foundation for the students who want to major other subjects from natural and social science areas. This course starts with the set & logic and develops through drawing of functions, solving equations & inequalities and reaches to complex number system to lay firm foundation of higher mathematics.

# 2. The general objectives

The general objectives of this course are as follows:

* To familiarizes students with the basic concepts and operations of set theory.
* To enhance the knowledge of the logic to test validity of the arguments.
* To inculcate the skills of drawing graphs of function and inequalities.
* To let the students optimize linear programming problems by graphical method.
* To make the students understand the relation between roots of a quadratic equation and to develop skill of solving higher order polynomial equations
* .To familiarize the students with logarithm and its properties
* To make the students understand the concept of complex number and apply this concept to derive roots of complex numbers.

# 3. Specific Objectives and Contents

|  |  |
| --- | --- |
| * Define set with examples. * Perform basic set operations. * Represent sets and operations in Venn-diagram. * Define statements and identify connectives. * Construct truth or falsity of a simple and the compound statements. * Construct validity of the arguments. | Unit I: Sets and Logic. (8)   * Sets and their types * Relation of sets and representation * Operations on sets with their properties * Statements with Connectives, Negation, Conditional and bi-conditional statements * Truth tables of simple and compound statements * Arguments and the test of their validity |
| * Define relation and function. * Analyze properties of functions. * Draw graphs of the functions of different forms: linear, quadratic, simultaneous equations. | Unit II: Functions and Graphs (6)   * Locating points in plane * Order pair, Cartesian product of two sets, relations and functions. * Types of function(1-1 onto, into, Inverse, linear, quadratic and other degree functions, Increasing and decreasing functions) * Functions and their graphs   + General form of Quadratic equations and its graph   + Graph of function y= * System of homogeneous equations and their graph |
| * Differentiate with examples the equation and inequality * Solve for roots of quadratic equations * Solve equations reducible to linear and quadratic forms * Solve system of linear equations in two variables * Solve inequalities of single variable * Draw graph of inequalities of two variables * Solve linear programming problems by graph | Unit III: Equations and Inequalities (8)   * Introduction to equation and inequalities * Linear and quadratic equations * Roots of linear and quadratic equations * Equations reducible to linear and quadratic equations * System of first degree two variables equation and their solution * Inequalities, their properties * Roots of linear and quadratic inequalities of one variable * Graph of inequalities of one and two variables and their solution set * Solution of linear programming problems by graphical method |
| * Define polynomial equations * State properties of polynomial equations * Form polynomial equations when roots are given * Solve polynomial equations under certain given conditions | Unit IV: Theory of Equations (6)   * Polynomials * Polynomial equations (linear, quadratic, cubic, biquadratic etc.) * General properties of polynomial equations * Forming polynomial equations * Solving polynomial equations with given conditions |
| * Define logarithm * Sketch the graph of logarithm. * Prove properties of logarithm. * Use logarithm concept in complex calculation. | Unit V: Logarithm (6)   * Definition and graph of logarithm * Properties of logarithm * Change of base * Computation with logarithm |
| * To define complex numbers * To prove properties of absolute value of complex numbers * To find square root of a complex number * To derive properties of cube roots of unity * To find product and quotient of a complex numbers in trigonometric form. * To derive roots of a complex number using De-Moivre's theorem. | Unit VI: Complex Numbers (14)   * Complex number and Argand diagram * Modules and argument of a complex number * Algebraic properties of complex numbers * conjugate and absolute value of complex number * Properties of absolute values of complex numbers * Square root of complex numbers * Cube roots of unity * Properties of cube roots of unity * Trigonometric form of complex numbers * Product and quotient of complex numbers in trigonometric form * De-Moivre's theorem (Integral powers only) * Roots of complex numbers |

# 4. Instructional Techniques

4.1 **General 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, collaborative teaching approach and problem solving method.

**4.2 Specific Instructional Techniques**

The specific teaching and learning techniques chapter wise are listed below:

|  |  |  |
| --- | --- | --- |
| Unit | Activity and Instructional Techniques | Teaching Hours ( 48 ) |
| 1 | Discussion and sharing experiences. | 08 |
| 2 | Project work in group | 06 |
| 3 | Problem based learning in group | 08 |
| 4 | Question answer and discussion in group | 06 |
| 5 | Assignment and discussion | 04 |
| 6 | Collaborative problem solving in given problems | 16 |

# 5 Evaluation

5.1 **Internal Evaluation** 40%

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

Attendance 4 marks

Participation in learning activities 6 marks

First assignment 10 marks

Second assignment 10 marks

Third assignment 10 marks

Total 40 marks

5.2 **External Evaluation** (60%)

The examination section 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 type questions (multiple choice ) 10 x 1 mark = 10 marks

Short answer questions 6 x 5 marks = 30 marks

Long answer questions 2 x 10 marks = 20 marks

Total = 60 marks

**6. Recommended Book**

**Compendium will be developed by Dean’s Office of Faculty of Education**

**Reference Books**

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

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 PanditShantinagar.

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.