Course Title: Quantitative Methods-I   Semester: 01

Course Code: BSC-101   Credit Hours: 03

1.0 Introduction of the Course

This course introduces quantitative methods-I concepts and their applications in economics, business and finance. It also aims to equip students with practical skills to apply the concepts in real life. For this purpose, the course covers basic mathematical processes and techniques currently used in the fields of business and finance. It includes a review of main business math skills with particular emphasis on equations, percentages, interest, discounts, simple interest, compound interest, loan installments. This course is designed to provide strong mathematical foundations to enable the students to analyze data on the basis of modern mathematical techniques.

2.0 Pre-Requisites Course (s) or Other Requirements/Skills:

The course requires understanding of basic mathematical concepts

3.0 Course Learning Outcomes

The course carries following objectives:

1. To develop an understanding about basic concepts used in algebra and mathematics
2. To introduce student to different forms of equations
3. To help solve different Binomial expressions
4. To explain how to analyze progression and find the missing value of series and sum of a series and any term of a series that will help them in business decision making process
5. To facilitate understanding about the process of calculating the return on business investment by using profitability analysis
6. To help analyze annuity and its types with practice questions
7. To explain basic concepts in matrix algebra
8. To help explain how mathematical programming can be used to construct a model from past information to facilitate forecasting and problem solving

4.0 Course Learning Outcomes

At the end of the course students will be able to:

1. Solve the algebraic expression and also able to find the value of in the business problems even where direct calculations are impossible
2. Analyze mathematical and business problems with in a given situation and with a particular give conditional arrangement
3. Learn the application of roots and powers in solving problem with help of logarithms
4. Find the higher square and roots with high value by applying logarithm which is not possible in simple calculation easily
5. Apply the equations to solve business problems and to find the hidden value

6.   To take business and investment decisions by comparing returns with the application of different techniques
7.   Plan and forecast on the basis of past information

5.0 Course Contents:

Unit-1:
    1.1 Exponential and Logarithmic functions
    1.2 Understanding basics of exponents and logarithmic functions and their application to business and finance

Unit-2:
    1.1   Equation of straight line and its application in business and economics
    1.2   Understanding various forms of straight line equation and its application to various business problems

Unit-3:
3.1.1.   Simultaneous equation – linear and quadratic

3. 1.2.   Understanding simultaneous equations and their application to business problem

Unit-4:
4.1   Coordinate system and line inequalities and their graphs

4. 1.1.   Understanding of basic coordinate systems and preparation of graphs
4. 1.2.   Understanding of linear inequalities and preparation of graphs

4. 1.3.   Progression or Series

Unit-5: Factorization of equations
5.1.1   Application of multiplication and division operations on linear and quadratic equations
5.1.2   Solving quadratic equations through factorization and completing the square method
5.1.3   Permutation, Combinations and Binomial Expansion

Unit-6: Arithmetic and Geometric progression
6.1 Understanding and applying arithmetic progression to business problem
6.2 Understanding and applying geometric progression to business problems

Unit-7:
    8.1 Linear programming
    8.2 Understanding application of linear programming using graphs
    8.3 Identification of constraints, cost minimizations, profit maximization, redundant constraints to solve programs
    8.4 Use of corner point theorem
    8.5 Analysis of graphical solution to see bounded or unbounded feasible regions
Unit-8:   Basic Calculus: rules for Differentiation-Sum, difference, product and quotient rules of differentiation
    3.1   Understanding basic calculus and basic rules of differentiation.

3.1.1 Basic Calculus: Marginal function, calculation of revenue, costs and profits of marginal units

3.1.2 Application of differentiation techniques to calculate revenues, costs, and profits of marginal units

3.1.3 Basic calculus: Second order derivatives and their use

3.1.4 Learning to calculate maxima, minima, and point of inflexion

Unit-9: Fundamentals of matrices

9.1.1 Understanding of basic matrix algebra and its application (addition, subtraction, and multiplication)

9.1.2 Learning to calculation of determinant, adjoin, and inverse of matrix

9.1.3 Solving simultaneous linear equations using Cramer's rule and matrix inverse method

9.1.4 Understanding to use matrix algebra for solution of simultaneous linear equations

9.1.5 Application Cramer's rule matrix inverse method

9.1.6 Basics of financial mathematics: Simple interest, compound interest, present value, future value

9.1.7 Using basic functions of time value of money

9.1.8 Calculation of simple and compound interest

9.1.9 Calculation of present and future values of a single sum

Unit-10: Annuities

10.1.1 Understanding and calculation of present value and future value of annuities using both formula and financial table

10.1.2 Internal rate of return, interpolation, and perpetuities
Understanding and calculation of IRR, and present value of perpetuity

Revision and makeup

Suggested topics:
Sets, relations and functions

Ratios and proportions

Shares, Loan, mortgage and bonds

Investment Decisions
Introduction to Mathematical Programming, Models, Algorithms

Application of mathematics in business

Application of linear equations

Breakeven analysis

Differential calculus

6.0 Teaching-Learning Strategies

- ➢ Lectures
- ➢ Handouts (hard or soft copies)
- ➢ Group Discussions
- ➢ Presentations

➤ Assignments

7.0 Assignments

➤ Short tests
➤ Quizzes
➤ Term Paper
➤ Research Papers

9.0 Textbooks

1. Bowra, Z. A. (2020). Business Statistics and Mathematics, Azeem Academy, Lahore

10. Suggested Readings

10.1 Books

➤ Mirza, S.H. (latest edition). Business Mathematic for Management and Finance,
➤ L W Stafford, Business Mathematics.
➤ Richard Lacava, Business Statistics.
➤ Nasir Ali Syed, and G H Gill, Statistics and Business Mathematics, Fair Publication, Lahore

10.2 Journal Articles/ Reports/ Web Sources

➤ https://www.khanacademy.org/math
➤ https://www.mathsisfun.com/index.htm
➤ https://www.intmath.com/
➤ https://www.ixl.com/math/
➤ https://www.mathplanet.com/