

Deccan Education Society's

**Kirti M. Doongursee College of
Arts, Science and Commerce
(AUTONOMOUS)**



Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for

Program: Bachelor of Commerce

Course: F.Y.B.Com.

Subject: Mathematical and Statistical
Techniques

Choice Based Credit System (CBCS)

with effect from

Academic Year 2022-2023

About the Course

There is a Rapid expansion of knowledge in subject matter areas and improved instructional method during last decade. There are considerable curricular revisions happening at the high school level. Application of Mathematics and Statistics are widely used in industry and business. Keeping this in mind, a revision of syllabus required in accordance with the growth of subject of at the high school level and emerging needs of industry and its application.

Course Objectives:

The main objective of this course is to introduce mathematics and statistics to undergraduate students of commerce, so that they can use them in the field of commerce and industry to solve the real life problems.

Course Code	Course Title	Credits	Lectures /Week
KUCMST22101	Mathematical and Statistical Techniques	3	5

Learning Outcomes:

After successful completion of this course, students would be able to

1. Understand market instruments like shares and mutual funds and the trading of these instruments in financial markets.
2. Learn counting using permutations and combinations.
3. Understand the basic concepts of optimization using linear models (LPP).
4. Use different statistical tools likes averages and measures of dispersion for analyzing data statistically.
5. determine probability of occurrence or non-occurrence of an event
6. Understand decision-making processes.

Unit	Topics	No of Lectures
I	Unit I: Shares and Mutual Funds	15
II	Unit II: Permutation, Combination and Linear Programming Problems	15
III	Unit III: Summarization Measures	15
IV	Unit IV: Elementary Probability Theory	15
V	Unit V: Decision Theory	15

Semester-I

Course: KUCMST22101

Mathematical and Statistical Techniques

[A] MATHEMATICS: (40 marks)

Unit I: Shares and Mutual Funds

- a. **Shares:** Concept of share, face value, market value, dividend, equity shares, preferential shares, bonus shares. Simple examples.
- b. **Mutual Funds:** Simple problems on calculation of Net income after considering entry load, dividend, change in Net Asset Value (N.A.V.) and exit load. Averaging of price under the Systematic Investment Plan (S.I.P.)

Unit II: Permutation, Combination and Linear Programming Problems:

- a. **Permutation and Combination:** Factorial Notation, Fundamental principle of counting, Permutation as arrangement, Simple examples, combination as selection, Simple examples, combination as selection, Simple examples, Relation between ${}^n C_r$ and ${}^n P_r$ Examples on commercial applications of permutations and combinations.
- b. **Linear Programming Problem:** Sketching of graphs of (i) linear equation $Ax + By + C = 0$ (ii) linear inequalities. Mathematical Formulation of Linear Programming Problems up to 3 variables. Solution of Linear Programming Problems using graphical method up to two variables.

[B] STATISTICS: (60 marks)

Unit III: Summarization Measures:

- a. Measures of Central Tendencies:** Definition of Average, Types of Averages: Arithmetic Mean, Median, and Mode for grouped as well as ungrouped data. Quartiles, Deciles and Percentiles. Using Ogive locate median and Quartiles. Using Histogram locate mode. Combined and Weighted mean.
- b. Measures of Dispersions:** Concept and idea of dispersion. Various measures Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance, Combined Variance.

Unit IV: Elementary Probability Theory:

- a. Probability Theory:** Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events.
Classical definition of Probability, Addition theorem (without proof), conditional probability.
Independence of Events: $P(A.B) = P(A).P(B)$. Simple examples.
- b. Random Variable:** Probability distribution of a discrete random variable; Expectation and Variance of random variable, simple examples on probability distributions.

Unit V: Decision Theory:

Decision making situation, Decision maker, Courses of Action, States of Nature, Pay-off and Pay-off matrix; Decision making under uncertainty, Maximin, Maximax, Minimax regret and Laplace criteria; simple examples to find optimum decision. Formulation of Payoff Matrix. Decision making under Risk, Expected Monetary Value (EMV); Decision Tree; Simple Examples based on EMV. Expected Opportunity Loss (EOL), simple examples based on EOL.

F. Y. B. Com. (CBCS) SEMESTER – II

Course Code	Course Title	Credits	Lectures /Week
KUCMST22201	Mathematical and Statistical Techniques	3	5

Learning Outcomes:

After successful completion of this course, students would be able to

1. Find the rate of change of a dependent variable with respect to an independent variable especially with respect to economic functions like demand, supply, revenue, cost and profit. Solving optimization problems by determining relative extrema for economic functions like profit and loss.
2. Use principles of simple interest and compound interest to solve relevant problems in financial applications, for example, those involving annuities, loans and mortgages, bonds and sinking funds, and investment decisions.
3. Correlate two variables according to their magnitude and direction and use linear regression techniques to estimate one variable given the value of the other given that they are correlated.
4. Estimate trend values of a variable from a time series used for forecasting thereby controlling a physical system and its business outcomes.
5. Use index numbers to estimate real income and construct consumer price index number and other price related index numbers.
6. Use discrete and continuous probability distributions to compute probability of real world events and applications.

Unit	Topics	No of Lectures
I	Unit I: Functions, Derivatives and Their Applications	15
II	Unit II: Interest and Annuity	15
III	Unit III: Bivariate Linear Correlation and Regression	15

IV	Unit IV: Time series and Index Numbers	15
V	Unit V: Elementary Probability Distributions	15

Semester-II

Course: KUCMST22201

Mathematical and Statistical Techniques

[A] MATHEMATICS: (40 marks)

Unit I : Functions, Derivatives and Their Applications

a. Concept of real functions: constant function, linear function, x^n , e^x , a^x , $\log x$. Demand, Supply, Total Revenue, Average Revenue, Total cost, Average cost and Profit function. Equilibrium Point, Break-even point.

b. Derivative of functions:

i. Derivative as rate measure, Derivative of x^n , e^x , a^x , $\log x$.

ii. Rules of derivatives: Scalar multiplication, sum, difference, product, quotient (Statements only), Simple problems. Second order derivatives.

iii. Applications: Marginal Cost, Marginal Revenue, Elasticity of Demand.

Maxima and Minima for functions in Economics and Commerce.

(Examination Questions on this unit should be application oriented only.)

Unit II: Interest and Annuity:

a. Interest: Simple Interest, Compound Interest (Nominal & Effective Rate of Interest), Calculations involving up to 4 time periods.

b. Annuity: Annuity Immediate and its Present value, Future value. Equated Monthly Installments (EMI) using reducing balance method & amortization of loans. Stated Annual Rate and effective Annual Rate Perpetuity and its present value. Simple problems involving up to 4 time periods.

[B] STATISTICS: (60 marks)

Unit III: Bivariate Linear Correlation and Regression

a. Correlation Analysis: Meaning, Types of Correlation, Determination of Correlation: Scatter diagram, Karl Pearson's method of Correlation Coefficient (excluding Bivariate Frequency Distribution Table) and Spearman's Rank Correlation Coefficient.

b. Regression Analysis: Meaning, Concept of Regression equations, Slope of the Regression Line and its interpretation. Regression Coefficients (excluding Bivariate Frequency Distribution Table), Relationship between Coefficient of Correlation and Regression Coefficients, Finding the equations of Regression lines by method of Least Squares.

Unit IV : Time series and Index Numbers

a. Time series: Concepts and components of a time series. Representation of trend by Freehand Curve Method, Estimation of Trend using Moving Average Method and Least Squares Method (Linear Trend only). Estimation of Seasonal Component using Simple Arithmetic Mean for Additive Model only (For Trend free data only). Concept of Forecasting using Least Squares Method.

b. Index Numbers: Concept and usage of Index numbers, Types of Index numbers, Aggregate and Relative Index Numbers, Lasperye's, Paasche's, Dorbisch-Bowley's, Marshall-Edgeworth and Fisher's ideal index numbers, Test of Consistency: Time Reversal Test and Factor Reversal Test. Chain Base Index Nos. Shifting of Base year. Cost of Living Index Numbers, Concept of Real Income, Concept of Wholesale Price Index Number. (Examples on missing values should not be taken)

Unit V: Elementary Probability Distributions Probability Distributions:

i. Discrete Probability Distribution: Binomial, Poisson (Properties and applications only, no derivations are expected)

ii. Continuous Probability distribution: Normal Distribution. (Properties and applications only, no derivations are expected)

Textbooks:

1. Business Mathematics and Statistics : Vaidya Deshpande – Vipul Prakashan
2. Mathematical and Statistical Techniques: Neena Joshi and others – Sheth Publications

Additional References:

Reference Books:

1. Mathematics for Economics and Finance Methods and Modelling by Martin Anthony and Norman Biggs, Cambridge University Press, Cambridge low-priced edition, 2000, Chapters 1, 2, 4, 6 to 9 & 10.
2. Applied Calculus: By Stephen Waner and Steven Constenoble, Brooks/Cole Thomson Learning, second edition, Chapter 1 to 5.
3. Business Mathematics By D. C. Sancheti and V. K. Kapoor, Sultan Chand & Sons, 2006, Chapter 1, 5, 7, 9 & 10.
4. Mathematics for Business Economics: By J. D. Gupta, P. K. Gupta and Man Mohan, Tata Mc- Graw Hill Publishing Co. Ltd., 1987, Chapters 9 to 11 & 16.
5. Quantitative Methods-Part-I By S. Saha and S. Mukerji, New Central Book Agency, 1996, Chapters 7 & 12.
6. Mathematical Basis of Life Insurance By S.P. Dixit, C.S. Modi and R.V. Joshi, Insurance Institute of India, Chapters 2: units 2.6, 2.9, 2.20 & 2.21.
7. STATISTICS by Schaum Series.
8. Fundamentals of Statistics - D. N. Elhance.
9. Statistical Methods - S.G. Gupta (S. Chand & Co.
10. Statistics for Management - Lovin R. Rubin D.S. (Prentice Hall of India)
11. Statistics - Theory, Method & Applications D.S.Sancheti & V. K. Kapoor.
12. Modern Business Statistics - (Revised)-B. Pearles & C. Sullivan – Prentice Hall of India.
13. Business Mathematics & Statistics : B Aggarwal, Ane Book Pvt. Limited
14. Business Mathematics : D C Sancheti & V K Kapoor, Sultan Chand & Sons

15. Business Mathematics : A P Verma, Asian Books Pvt. :Limited.

Evaluation Scheme for First Year (UG) under AUTONOMY

I. Internal Evaluation for Theory Courses – 40 Marks

- (i) Continuous Internal Assessment 1 – Assignment/Tutorial – 20 marks
- (ii) Continuous Internal Assessment 2 : 5 fill in the blanks(5 marks)+ 5 True or false questions (5 marks) + 5 Simple problem solving(10 Marks) – 20 marks

II. External Examination for Theory Courses – 60 Marks

Duration: 2 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Options	Marks
Q.1	Unit I	<i>Any 3 out of 4</i>	12
Q.2	Unit II	<i>Any 3 out of 4</i>	12
Q.3	Unit III	<i>Any 3 out of 4</i>	12
Q.4	Unit IV	<i>Any 3 out of 4</i>	12
Q.5	Unit V	<i>Any 3 out of 6</i>	12

Note: The evaluation pattern is identical for both semesters.