Rayat Shikshan Sanstha's

Karmaveer Bhaurao Patil College Vashi, Navi Mumbai

(Autonomous)

[University of Mumbai]

Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of Course	**F.Y.B.Com.-** Business Mathematics and Statistics
2	Eligibility for Admission	**12th and equivalent [of recognized Boards]**
3	Passing Marks	**40%**
4	Ordinances/Regulations (if any)	
5	No. of Years/Semesters	**One year/Two semester**
6	Level	**U.G.**
7	Pattern	**Semester**
8	Status	**Revised**
9	To be implemented from Academic year	**2021-22**

Rayat Shikshan Sanstha's
KARMAVEER BHAURAO PATIL COLLEGE, VASHI.
NAVI MUMBAI
Sector-15- A, Vashi, Navi Mumbai - 400 703

(AUTONOMOUS)

Syllabus for Mathematics

Program: B.Com.

Course: F.Y.B.Com.- Business Mathematics and Statistics

(Choice Based Credit System
with effect from the academic year 2021-2022)

Preamble of the Syllabus:

Bachelor of Commerce (B.Com.) is a under graduation Programme of Department of Commerce, Karmaveer Bhaurao Patil College Vashi, Navi Mumbai [Autonomous College]

The Choice Based Credit System to be implemented through this curriculum, would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The students pursuing this course would have to develop understanding of various aspects of the computer. The conceptual understanding, development of experimental skills, developing professional skills, acquiring basic concepts and understanding of computer techniques are among such important aspects.

Syllabus

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and examples.

Semester I

Course Code	Unit	Topics	Credits	L/Week
Business Mathematics and Statistics -I				
UGMS101	I	**Interest and Annuity**	3	3
	II	**Matrices, Determinants and Linear Programming Problems**		
	III	**Summarization Measures**		
	IV	**Permutation and Combination and Elementary**		
	V	**Decision Theory**		

Semester II

Course Code	Unit	Topics	Credits	L/Week
Business Mathematics and Statistics -II				
UGMS201	I	**Functions, Derivatives and Their Applications**	3	3
	II	**Shares and Mutual Funds**		
	III	**Bivariate Linear Correlation and Regression**		
	IV	**Time series and Index Numbers**		
	V	**Elementary Probability Distributions**		

Practical Batch Size: 20 Students per batch

PROGRAMME OUTCOMES

Commerce graduate will be able to:

1. **Disciplinary Knowledge:** Built conceptual foundation and application skills in the area of accountancy, finance, management, research Marketing, Human Resource Management, Business and Corporate Law, economics, Finance, Accounting, Management, Tax, Investment, Insurance, and Banking seeking youth fit for Employment.

2. **Communication Skills:** Communicate Long Standing Unsolved problems in commerce; and to show the importance of commerce in Socio-Economic Development.

3. **Critical Thinking:** Apply the analytical and decision making skills to various problems appearing in different branches of Commerce and Business.

4. **Problem Solving:** Detect the problem originating in the diverse management areas such as Finance, Marketing, Human Resource, and Taxation; examine the problem, analyse and synthesize data and derive inferences to comprehend solutions to the problems.

5. **Research related Skills:** Identify, formulate and analyse socio-economic and environmental problems to arrive at substantiated conclusions for sustainable development using the fundamental principles of various branches of Commerce and Business.

6. **Digital literacy:** Use various technical ICT tools for exploring, analysing and using the information for business purposes for global competency.

7. **Analytical reasoning:** Develop disciplinary knowledge and tactical depth-ness, with a broader skill set and encourage them to seek out resolute, innovative solutions for dynamic business.

8. **Moral & Ethical Awareness:** Ascertain Unethical Behaviour, falsification, and manipulation of information in business and managing self and various social systems**.**

9. **Lifelong Learning:** Demonstrate knowledge and understanding of management principles and apply these to one's own profession / career. Capability to work independently in diverse projects and ensure detailed study of various facets Commerce and Business.

10. **Leadership & Teamwork:** Work effectively with groups and individuals and take lead in implementation of plans in various fields of commerce and its allied sectors.

11. **Environment and Sustainability:** Understand the impact of the professional accounting solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

Course: Business Mathematics and Statistics -I
Course code: UGMS101

Course Outcomes: After successful completion of this course, students will be able to:
    1: Define the various averages and measures of dispersion for given statistical data.
    2: Explain basics of financial arithmetic.
    3: Analyze problems in business to determine appropriate methods for solving them using business math concepts and applications.
    4: Formulate and solve Linear Programming Problem graphically.

[A] MATHEMATICS: (24 marks)

Unit I: Interest and Annuity:
Content of the Unit:
  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 & Affective Annual Rate Perpetuity and its present value, Simple problems involving up to 4 time periods.

Unit II: Matrices, Determinants and Linear Programming Problems:
Content of the Unit:
  a. **Matrices**: Some important definitions and some important results. Matrix operation (Addition, scalar multiplication, matrix multiplication, transpose of a matrix).
  b. **Determinant**s of a matrix of order two or three properties and results of Determinants, solving a system of linear equations using Cramer's rule, Inverse of a Matrix (up to order three) using adjoint of a matrix and matrix inversion method, Input Output Analysis.
  c. **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: (36 marks)

Unit III: Summarization Measures:
Content of the Unit:

  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: Permutation and Combination and Elementary Probability Theory:

Content of the Unit:
  a. **Permutation and Combination:** Factorial Notation, Fundamental principle of counting, Permutation as arrangement, combination as selection, Relation between n_{c_r} and n_{p_r} , Examples on commercial application of permutation and combination.

b. **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, Independence of Events: $P(A \cap B) = P(A) P(B)$, Simple examples.

c. **Random Variable**: Probability distribution of a discrete random variable; Expectation and Variance of random variable, simple examples on probability distributions.

Unit V: Decision Theory:

Content of the Unit:
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.

UGMS101C: Business Mathematics and Statistics-I

Course Outcomes: After successful completion of this course, students will be able to:
    CO-1: Define the various averages and measures of dispersion for given statistical data.
    CO-2: Explain basics of financial arithmetic.
    CO-3: Analyse problems in business to determine appropriate methods for solving them using business math concepts and applications.
    CO-4: Formulate and solve Linear Programming Problem graphically.

ICT Tools Used: Videos, PPT, Pen-Tablet

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://nptel.ac.in/courses/111/105/111105041/
2. https://onlinecourses.swayam2.ac.in/cec20_mg13/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	1	-	-	-	-	-	-	-	-
CO2	1	-	2	1	-	-	-	-	-	-	-
CO3	1	-	3	1	-	-	-	-	-	-	-
CO4	1	-	2	3	-	-	-	-	-	-	-

*In CO-PO Mapping Matrix: a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium), 3 being substantial (high), and '-' indicate there is no correlation in respective CO and PO.

Semester II

Course: Business Mathematics and Statistics-II
Course code: UGMS201

Course Outcomes: After successful completion of this course, students will be able to:
- **1:** Define the various averages and measures of dispersion for given statistical data.
- **2:** Explain basics of financial arithmetic.
- **3:** Analyze problems in business to determine appropriate methods for solving them using business math concepts and applications.
- **4:** Formulate and solve Linear Programming Problem graphically.

[A] MATHEMATICS: (24 marks)

Unit I: Functions, Derivatives and Their Applications
Content of the Unit:

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 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: Shares and Mutual Funds

Content of the Unit:

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.)

[B] STATISTICS: (36 marks)

Unit III: Bivariate Linear Correlation and Regression
Content of the Unit:

a. **Correlation Analysis:** Meaning, Types of Correlation and 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
Content of the Unit:

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
Content of the Unit:

Binomial, Poisson (Properties and applications only, no derivations are expected), Normal Distribution. (Properties and applications only, no derivations are expected).

Reference Books:

1. Business Mathematics by D. C. Sancheti and V. K. Kapoor, Sultan Chand & Sons, 2006, Chapter 1, 5, 7, 9 &10.
2. Quantitative Methods, Part-I by S. Saha and S. Mukerji, New Central Book Agency, 1996, Chapters 7 & 12.
3. 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.
4. Indian Mutual Funds Handbook: by Sundar Shankaran, Vision Books, 2006, sections 1.7, 1.8.1, 6.5 & Annexure 1.1to 1.3.
5. STATISTICS by Schaum Series.
6. Modern Business Statistics - (Revised}-B. Pearles & C. Sullivan –Prentice Hall of India.
7. Business Mathematics & Statistics: B Aggarwal, Ane Book Pvt. Limited
8. Business Mathematics: D C Sancheti & V K Kapoor, Sultan Chand & Sons
9. Business Mathematics: A P Verma, Asian Books Pvt.: Limited.
10.

UGMS101C: Business Mathematics and Statistics-I

Course Outcomes: After successful completion of this course, students will be able to:
   CO-1: Define the various averages and measures of dispersion for given statistical data.
   CO-2: Explain basics of financial arithmetic.
   CO-3: Analyse problems in business to determine appropriate methods for solving them using business math concepts and applications.
   CO-4: Formulate and solve Linear Programming Problem graphically.

ICT Tools Used: Videos, PPT, Pen-Tablet

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:
1. https://nptel.ac.in/courses/111/105/111105041/
2. https://onlinecourses.swayam2.ac.in/cec20_mg13/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	1	-	-	-	-	-	-	-	-
CO2	1	-	2	1	-	-	-	-	-	-	-
CO3	1	-	3	1	-	-	-	-	-	-	-
CO4	1	-	2	3	-	-	-	-	-	-	-

*In CO-PO Mapping Matrix: a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium), 3 being substantial (high), and '-' indicate there is no correlation in respective CO and PO.

Tutorial:
1. Two tutorials to be conducted on each unit i.e., 10 tutorials per semester.
2. One tutorial per week per batch (per batch 25 students) should be conducted.

Assignment:
At the end of each semester one assignment of 10 marks should be given.

Scheme of Examination

For Semester I & II:

A. There will be a **Semester end examination** of **60 marks**.
1. The examinations shall be of **2 Hours** duration.
2. **Question Paper Pattern**
   a) In **Section I** (**based on Mathematics**), two questions carrying 12 marks each. First question should be on Unit I and Second question should be from Unit II.
   b) In each question there should be <u>four</u> sub-questions carrying 6 marks each. Students should be asked to answer any <u>two</u> sub questions from each question.
   c) In **Section II** (**based on Statistics**), three questions carrying 12 marks each. First question should be on Unit III, second question should be from Unit IV and third question should be from Unit V.
   d) In each question there should be <u>four</u> sub-questions carrying 6 marks each. Students should be asked to answer any <u>two</u> sub questions from each question.
   e) All the questions shall be compulsory with internal choices within the questions. Including the choices, the marks for each question shall be 24.

B. There will be a **Continuous Internal Assessment** for 40 marks.

Unit Test	Assignment	Tutorial	Total
20	10	10	40

Question paper pattern for Unit Test of 20 marks:

The unit test for 20 marks will be conducted online. There shall be 20 compulsory multiple-choice questions with single correct answer, each carrying one mark.