



Shri Vile Parle Kelavani Mandal's  
**MITHIBAI COLLEGE OF ARTS, CHAUHAN INSTITUTE OF  
SCIENCE & AMRUTBEN JIVANLAL COLLEGE OF COMMERCE  
AND ECONOMICS  
(TO BE AUTONOMOUS)**

NAAC Reaccredited "A" grade, CGPA: 3.57,  
Granted under FIST-DST & - Star College Scheme of DBT, Government of India  
Best College, University of Mumbai 2016-17

Affiliated to the  
**UNIVERSITY OF MUMBAI**

**Program : B.Com**

**Course : Mathematical and Statistical Techniques**

**Credit Based Semester and Grading System (CBCS) with effect  
from the academic year 2022-23**

**SEMESTER I & II**

**A.C No. 13**

**AGENDA No. 2.13**

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## **PROGRAMME SPECIFIC OUTCOMES (PSO'S)**

On completion of the B.Com, the learners should be enriched with knowledge and be able to :

**PSO1:** Gain thorough systematic and subject skills within various disciplines of commerce, business, business law, business statistics, banking, accounting, tax, finance, cost accounting, entrepreneurship, auditing, strategic management and marketing.

**PSO2:** Apply financial accounting, advanced accounting, managerial accounting, career skills, both quantitative and qualitative knowledge to their future careers in business.

**PSO3:** Recognize features and roles of businessmen, entrepreneurs, managers and consultants, which will help students to possess knowledge and other soft skills and to react aptly when confronted with critical decision making.

**PSO4:** Gain proficiency to answer professional exams like CA, CS, ICWA, CMA and other diploma courses such as Tally ERP 9, and MS- Excel.

**PSO5:** Acquire the skills of effective communication, decision making, and problem solving in day to day business affairs.

**PSO6:** Acquire practical skills to work as tax consultant, cost accountant, audit assistant and other financial supporting services.

**PSO7:** Identify and understand the financial statements prepared on the basis of Generally Accepted Accounting Principles (GAAP) as well as Indian Accounting Standards and as per International Financial Reporting Standards (IFRS)

### **Preamble**

With the introduction of Credit Based Semester & Grading System (CBSGS) and continuous evaluation consisting of components of Internal Assessment & External Assessment by the esteemed University from the academic year 2011-12 at F.Y.B.Com. level, the earlier existing syllabus of F.Y.B.Com. Mathematical and Statistical Techniques was restructured according to the CBSGS pattern for implementation from 2011-12.

Some of the modules of the earlier syllabus of F.Y.B.Com. have been upgraded with the new modules in order to make the learners aware about the recent developments in various branches of Mathematics and Statistics. It has applications in Social Science, Operation Research, Finance, Actuarial Science, etc.

The Syllabus covers the prerequisites of Business Mathematics and Statistics.

Business Mathematics covers the topics such as Shares and Mutual Funds, Interpolation & finite differences, Linear Programming Problem(LPP), Functions, Derivatives and their applications, Interest and Annuity.

Business Statistics covers the topics such as Measures of Central Tendencies, Measures of Dispersion, Elementary Probability Theory, Decision Theory, Correlation and Regression, Time Series and Index Numbers, Elementary Probability Distributions.

Both the courses of theory (Semester-I & Semester-II) are compulsory for the students offering Mathematics as a single major subject.

A big thank you to all the Board of studies Member for the valuable contribution in framing the syllabus.

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**Evaluation Pattern**

The performance of the learner will be evaluated in two components. The first component will be a Continuous Assessment with a weightage of 25% of total marks per course. The second component will be a Semester end Examination with a weightage of 75% of the total marks per course. The allocation of marks for the Continuous Assessment and Semester end Examinations is as shown below:

**a) Details of Continuous Assessment (CA)**

25% of the total marks per course:

Continuous Assessment	Details	Marks
Component 1 (CA-1)	Internal test	15 marks
Component 2 (CA-2)	Assignment	10 marks

**b) Details of Semester End Examination**

75% of the total marks per course. Duration of examination will be two and half hours.

Question Number	Description	Marks	Total Marks
1	On Module I Attempt any three out of four each of 5 marks	$3 \times 5 = 15$	15
2	On Module II Attempt any three out of four each of 5 marks	$3 \times 5 = 15$	15
3	On Module III Attempt any three out of four each of 5 marks	$3 \times 5 = 15$	15
4	On Module IV Attempt any three out of four each of 5 marks	$3 \times 5 = 15$	15
5	On Module I, II, III, IV Attempt any three out of four each of 5 marks	$3 \times 5 = 15$	15
Total Marks			75

*Alka Mishra*

Mrs. Alka Mishra  
Head, Department of Mathematics

*Meenakshi Vaidya*

Dr. Meenakshi Vaidya  
Vice-Principal

*Krutika Desai*

Dr. Krutika Desai  
I/C Principal

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<b>Program: B.Com</b>				<b>Semester : I</b>	
<b>Course : Course : Mathematical and Statistical Techniques-I</b>				<b>Code:</b>	
<b>Academic Year: 2022-2023</b>					
<b>Teaching Scheme</b>				<b>Evaluation Scheme</b>	
<b>Lectures</b>	<b>Practicals</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Internal Continuous Assessment (ICA) (weightage)</b>	<b>End Semester Examinations (ESE) (weightage)</b>
<b>60</b>	<b>Nil</b>	<b>15</b>	<b>05</b>	<b>25 Marks</b>	<b>75 Marks</b>
<b>Internal Component</b>					
<b>Class Test (Duration 20 Mins)</b>			<b>Projects / Assignments</b>		<b>Class Participation</b>
<b>15 Marks</b>			<b>10 Marks</b>		-
<b>Learning Objectives :</b>					
<ol style="list-style-type: none"> <li>1. To provide an overview to the students with the basic concepts involved in Mathematics and Statistics.</li> <li>2. To apply the basics of Mathematical and Statistical skills which are imperative in Economics and Management.</li> <li>3. To take well informed decisions in predictable and uncertain situations.</li> </ol>					
<b>Learning Outcomes :</b> After completion of the course, students would be able to:					
After completion of the course, learners would be able to:					
<b>CO1:</b> Apply knowledge of Shares and Mutual funds to make wise investment.					
<b>CO2:</b> Use the knowledge of derivatives, partial derivatives, Maxima, Minima in Economics.					
<b>CO3:</b> Apply decision theory to select best action.					
<b>CO4:</b> Calculate averages and use it appropriately in real life problems					
<b>CO5:</b> Recall the definition of probability					
<b>CO6:</b> Define the concepts of probability and conditional probability and random variables and use these concepts in other fields.					
<b>CO7:</b> Understand the various issues involved in the collection, analysis and arriving at conclusive decisions regarding quantitative data.					

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**CO8:** Understand and appreciate the practical relevance of various basic statistical tools in the Field of finance and economics.

**Pedagogy:**

The objective of the course is to encourage students to learn and appreciate the use of the various tools of Mathematics and Statistical Techniques with regard to scientific management in businesses. Hence,

1. Adaptive teaching methods.
2. To invoke Computational thinking in problem solving.
3. Classroom session with applications in MS-excel in Tutorial Lecture.
4. Students would be given project/field work for better understanding of the concepts.

**Detailed Syllabus: ( per session plan )**

**Session Outline For Mathematical and Statistical Techniques I**

**Each lecture session would be of one hour duration (60 sessions)**

<b>Module</b>	<b>Module Content</b>	<b>Module Wise Pedagogy Used</b>	<b>Module Wise Duration</b>	<b>Module Wise Reference Books</b>
I	<p><b>Shares and Mutual Funds</b></p> <p>a. <b>Shares:</b> Concept of share, face value, market value, dividend, equity shares, Preferential shares, bonus shares, Right issue of Share, Split and Consolidation.</p> <p>b. <b>Mutual Funds:</b> types of 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.) systematic withdrawal plan (S.W.P.).</p>	Classroom sessions with critical thinking.	7+8	<p>1. Financial Mathematics by Prarthana Shahi.(Ane's Student Edition)</p> <p>2. Business mathematics and statistics by V.R.Nikam (Chandralok Prakashan)</p>

	<p><b>Derivative of functions, Partial derivative and Applications :</b></p> <p><b>a. Functions:</b> Introduction to functions and Types of Functions: Explicit, Implicit, Single valued, Multi valued, constant, polynomial, Exponential and logarithmic (concepts only) Functions in Economics: Demand function, Supply Function, Cost Function, Total Revenue function, Profit Function</p> <p><b>b. Derivatives:</b> Derivatives as rate Measure: Derivatives of <math>x^n, e^x, a^x, \log x</math>. Rules of differentiation: Scalar multiplication, Sum, difference, product, Quotient and chain rule (statement only) simple problems. Problems on parametric, taking log on both sides not included.</p> <p><b>c. Applications of Derivatives concerning only economic applications:</b> 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.)</p>	<p>Classroom sessions with adaptive methods &amp; critical thinking.</p>	<p>3+7+5</p>	<p>1. Business Mathematics D.C.Sancheti and V.K.Kapoor. (Sultan Chand &amp; Sons.) 2.Mathematics for business economics by J.D. Gupta, P.K.Gupta and Man Mohan</p>
<p>III</p>	<p><b>Introduction and Summarization of Measures :</b></p> <p><b>a. Introduction:</b> Meaning, Scope and Limitations of Statistics, Basic Statistical Concepts: Population, Sample, variate, Attributes, Parameter, Statistic. Types of data, Sources of data: Primary and secondary, sample and census survey.</p> <p><b>b. Summarization of Measures :</b> I) <b>Measures of Central Tendency:</b> Definition of Average, Types of Averages: Arithmetic Mean, Combined and Weighted arithmetic mean, median, and Mode for raw data, Ungrouped frequency distribution, grouped frequency</p>	<p>Classroom sessions with adaptive methods &amp; critical thinking.</p>	<p>2+6+7</p>	<p>1.Statistical Methods - S.G. Gupta (S. Chand &amp; Co.) 2. Quantitative Techniques for decision making by Anand Sharma. 3. Business Statistics Using excel</p>

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	<p>distribution. Quartiles, Deciles and Percentiles.</p> <p>II) <b>Measures of Dispersions:</b> Concept of dispersion. Absolute and relative measures of dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation and corresponding coefficients. Combined Standard deviation.</p>			and SPSS by Nick Lee and Mike.
IV	<p><b>Decision Theory :</b></p> <p>a. <b>Introduction :</b>Decision making situation, Decision maker, Courses of Action, States of Nature, Pay-off and Pay-off matrix;</p> <p>b. <b>Decision making under uncertainty:</b> Maximin, Maximax, Minimax regret and Laplace criteria; Formulation of Payoff matrix.</p> <p>c. <b>Decision making under Risk:</b> Expected Monetary Value (EMV); Expected Opportunity Loss (EOL), Expected value of perfect Information. Decision Tree for multistage decision making.</p>	Classroom sessions with critical thinking.	4+5+6	<p>1. Statistics for management by Richard Levin, David S. Rubin, Sanjay Rastogi /Masoo Husain Siddiqui.</p> <p>2. Operations Research Gupta and Kapoor.</p>

**Essential Reference Books:**

1. Financial Mathematics by Prarthana Shahi. (Ane's Student Edition)
2. Business mathematics and statistics by V.R. Nikam (Chandralok Prakashan)
3. Business Mathematics D.C. Sancheti and V.K. Kapoor. (Sultan Chand & Sons.
4. Mathematics for business economics by J.D. Gupta, P.K. Gupta and Man Mohan
5. Statistical Methods - S.G. Gupta (S. Chand & Co.)
6. Quantitative Techniques for decision making by Anand Sharma.
7. Business Statistics Using excel and SPSS by Nick Lee and Mike.
8. Statistics for management by Richard Levin, David S. Rubin, Sanjay Rastogi /Masoo Husain Siddiqui.

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9. Operations Research Gupta and Kapoor.

**Supplementary Reference Books:**

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>
Mathematics for Business Economics:	J. D. Gupta, P. K. Gupta and Man Mohan,	Tata Mc- Graw Hill Publishing Co. Ltd., 1987
Schaum Series STATISTICS	Murray Spiegel, Larry Stephens	Mc Graw Hill
Operations Research	Gupta and Kapoor	S. Chand & Sons Co.
Statistical Methods	S.G. Gupta	S. Chand & Sons Co.
Business Mathematics & Statistics	B Aggarwal	Ane Book Pvt. Limited
Statistics for management	Richard Levin, David S. Rubin, Sanjay Rastogi /Masooos Husain siddiqui.	Pearson
Mathematics & Statistics	Ajay Goel & Alka Goel.	Taxmann's Publication
Quantitative Techniques of Decision Making	Anand Sharma	Himalaya Publishing House
Business Statistics Using Excel & SPSS	Nick Lee & Mike	SAGE
Business mathematics and statistics	V.R.Nikam	(Chandralok Prakashan)

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<b>Program: B.Com</b>				<b>Semester : II</b>	
<b>Course : Course : Mathematical and Statistical Techniques-II</b>				<b>Code:</b>	
<b>Academic Year: 2022-2023</b>					
<b>Teaching Scheme</b>				<b>Evaluation Scheme</b>	
<b>Lectures</b>	<b>Practicals</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Internal Continuous Assessment (ICA) (weightage)</b>	<b>End Semester Examinations (ESE) (weightage)</b>
60	Nil	15	05	25 Marks	75 Marks
<b>Internal Component</b>					
<b>Class Test (Duration 20 Mins)</b>			<b>Projects / Assignments</b>		<b>Class Participation</b>
15 Marks			10 Marks		-
<b>Learning Objectives :</b>					
<ol style="list-style-type: none"> <li>4. To provide an overview to the students with the basic concepts involved in Mathematics and Statistics.</li> <li>5. To apply the basics of Mathematical and Statistical skills which are imperative in Economics and Management.</li> <li>6. To take well informed decisions in predictable and uncertain situations.</li> <li>7. To create interest and awareness for research and data analysis.</li> </ol>					
<b>Learning Outcomes :</b> After completion of the course, students would be able to:					
<b>Course Outcomes:</b>					
After completion of the course, learners would be able to:					
CO9: Demonstrate the basic concepts of simple and compound interest					
CO10: Apply the knowledge of Determinants and Matrices in solving equations of the two or more variables.					
CO11: Use shift operator for interpolation.					
CO12: Solve Compound Interest and Annuities					
CO13: Apply the analytical techniques to solve annuity problems					
CO14: Apply derivatives to solve optimization problems					
CO15: Understand that correlation coefficients independent of change of origin and scale					
CO16: Apply concept of regression to estimate value					
CO17: Analyze the behavior of stock market using time series					
CO18: Calculate cost of living index and price index					

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**CO19:** Detect the different probability distribution which are widely used  
Choose the suitable probability distribution corresponding to a given data

**Pedagogy:**

The objective of the course is to encourage students to learn and appreciate the use of the various tools of Mathematics and Statistical Techniques with regard to scientific management in businesses. Hence,

5. Adaptive teaching methods.
6. To invoke Computational thinking in problem solving.
7. Classroom session with applications in MS-excel in Tutorial Lecture.
8. Students would be given project/field work for better understanding of the concepts.

**Detailed Syllabus: ( per session plan )**

**Session Outline For Mathematical and Statistical Techniques II**

**Each lecture session would be of one hour duration (60 sessions)**

Module	Module Content	Module Wise Pedagogy Used	Module Wise Duration	Module Wise Reference Books
I	<p><b>Determinants and Matrices and Interpolation</b></p> <p>a. <b>Determinants:</b> Determinants of a matrix of order two or three, properties and results of determinants. Solving a system of linear equations through Cramer's Rule, Homogeneous and non-homogeneous equations.</p> <p>b. <b>Interpolation:</b> Different types of operators such as shift, forward, backward difference interpolation, Newton interpolation formula (for forward &amp; backward). Lagrange method (unequal length of intervals).</p>	Classroom sessions with adaptive methods & critical thinking.	7+8	<p>1. Matrices A. R. Vasishtha (Krishnas Prakashan )</p> <p>2. Mathematica 1 &amp; Statistical Techniques by R.K.Singh &amp; S.H.Kulkarni</p>

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II	<p><b>Interest and Annuity:</b></p> <p><b>a. Interest:</b> Simple Interest, Compound Interest (Nominal &amp; Effective Rate of Interest), Calculations involving upto 4 time periods.</p> <p><b>b. Annuity:</b> Annuity Immediate and its Present value, Future value. Equated Monthly Installments (EMI) using reducing balance method &amp; amortization of loans. Stated Annual Rate &amp; Effective Annual Rate Perpetuity and its present value. (Simple problems involving up to 4 time periods).</p>	Classroom sessions with adaptive methods & critical thinking.	6+9	<p>1. Financial Mathematics by Prarthana Shahi.(Ane's Student Edition)</p> <p>2. Business Mathematics by A.P.Verma (Asian Books private limited)</p>
III	<p><b>Probability &amp; Probability Distributions</b></p> <p><b>a. Probability Theory</b></p> <p>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.</p> <p>i) Classical definition of Probability, Addition theorem (without proof), conditional probability.</p> <p>ii) Independence of Events: <math>P(A \cap B) = P(A)P(B)</math>. Simple examples</p> <p>iii) Bayes Theorem</p> <p><b>b. Probability Distributions:</b></p> <p>i. Discrete Probability Distribution: Binomial, Poisson (Properties and applications only, no derivations are expected) Continuous Probability distribution: Normal Distribution. (Properties and applications only, no derivations are expected)</p>	Classroom sessions with adaptive methods & critical thinking.	8+7	<p>1. Statistics for management by Richard Levin, David S. Rubin, Sanjay Rastogi /Masoo Husain Siddiqui.</p> <p>2. Statistical Methods by S.P.Gupta.</p>
IV	<p><b>a. Time series:</b> concept and components of a time series. Representation of trend by freehand curve method,</p>	Classroom sessions with adaptive	4+5+6	<p>1. Quantitative Techniques of Decision Making by</p>

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	<p>estimation of trend using Moving Average method and least square 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 square method.</p> <p><b>b. Bivariate Linear Correlation and Regression:</b>  <b>Correlation Analysis:</b> Meaning, Types of Correlation, Methods of studying Correlation: Scatter diagram, Karl Pearson's method of Correlation Coefficient (excluding Bivariate Frequency Distribution Table), Coefficient of determination <math>R^2</math> and Spearman's Rank Correlation Coefficient.</p> <p><b>c. Regression Analysis:</b> 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 Coefficient, finding the equations of Regression lines by method of Least Squares.</p>	<p>methods &amp; critical thinking.</p>		<p>Anand Sharma (S.chand)                  2. Statistical Methods by S.P.Gupta.</p>
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**Essential Reference Books**

1. Matrices A. R. Vasishtha (Krishnas Prakashan )
2. Mathematical & Statistical Techniques by R.K.Singh & S.H.Kulkarni
3. Financial Mathematics by Prarthana Shahi. (Ane's Student Edition)
4. Business Mathematics by A.P.Verma (Asian Books private limited)
5. Statistics for management by Richard Levin, David S. Rubin, Sanjay Rastogi / Masoos Husain Siddiqui.
6. Statistical Methods by S.P.Gupta.
7. Quantitative Techniques of Decision Making by Anand Sharma (S.chand)

**Supplementary Reference Books:**

Title	Author(s)	Publisher
Business Mathematics	D. C. Sancheti and V. K. Kapoor	Sultan Chand & Sons, 2006,
Mathematics for Business Economics:	J. D. Gupta, P. K. Gupta and Man Mohan,	Tata Mc-Graw Hill Publishing Co. Ltd., 1987

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Schaum Series STATISTICS	Murray Spiegel, Larry Stephens	Mc-Graw Hill
Operations Research	Gupta and Kapoor	S. Chand & Sons Co.
Statistical Methods	S.G. Gupta	S. Chand & Sons Co.
Business Mathematics & Statistics	B Aggarwal	Ane Book Pvt. Limited
Statistics for management	Richard Levin, David S. Rubin	Sanjay Rastogi/MAsoos Husain Siddiqui.
Mathematics & Statistics	Ajay Goel & Alka Goel.	Taxmann's Publication
Quantitative Techniques of Decision Making	Anand Sharma	S. Chand & Co
Business Statistics Using Excel & SPSS	Nick Lee & Mike	SAGE
Mathematical & Statistical Techniques	R.K.Singh & S.H.Kulkarni	Aradhana Prakashan.
Matrices	A.R.Vasishtha	Krishnas Prakashan
Applied business Statistics	Ken Black	Wiley.