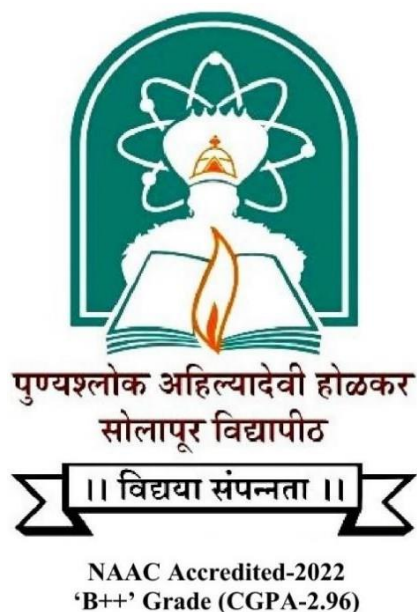


**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR
UNIVERSITY, SOLAPUR**



Name of the Faculty-Commerce and Management
Syllabus-NEP 2020

Name of the Course- B.Com. -II- Semester III and IV
B.Com. (Business Statistics)

With effect from June-2025

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY: COMMERCE AND MANAGEMENT

PROGRAMME: B.COM. (BUSINESS STATISTICS)

B.COM. - II SEMESTER – III AND IV (NEP 2020) W.E.F. JUNE 2025



Sr. No	Category	Title of the Subject	Course Credit	Weekly Hours	Total Lectures	Total Marks		
						UA	CA	Total
Semester III								
1	Major Mandatory	Business Statistics Paper III	04	04	60	60	40	100
2	Major Mandatory	Business Statistics Paper IV	04	04	60	60	40	100
3	Minor	Fundamentals of Statistics- I	04	04	60	60	40	100
4	OE Open Elective	Applied Statistics - I	02	02	30	30	20	50
5	Vocational Skill Course VSC	Business Statistics – Practical Paper -III (Practical)	02	02	30	30 (Practical)	20	50
Semester IV								
1	Major Mandatory	Business Statistics Paper V	04	04	60	60	40	100
2	Major Mandatory	Business Statistics Paper VI	04	04	60	60	40	100
3	Minor	Fundamentals of Statistics- II	04	04	60	60	40	100
4	OE Open Elective	Applied Statistics - II	02	02	30	30	20	50
5	Skill Enhancement Course (SEC)	Practical Using MS-Excel (Practical)	02	02	30	30 (Practical)	20	50

 पुन्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ (॥ विद्यया संपन्नता ॥) NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -III COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER III			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)
Preamble: To familiarize the students with basic concepts of the Business Statistics and a hands-on practice of the various statistical tools and techniques are the main intensions of this paper. It will enable them to improve their logical reasoning ability and interpretation of various business results. The course aims at acquainting the students with the emerging issues in business, trade and commerce regarding analyzing business facts. Course Outcomes: - After completion of this course the students enable 1) To understand the concept of central tendency and its importance in summarizing datasets. 2) To distinguish between absolute and relative measures of dispersion. 3) To Compute and interpret the correlation coefficients. 4) ToUnderstandtheconceptofregressionanalysisasastatisticaltechnique used for Prediction.			
Unit	Contents		Lectures
Unit I- Measures of Central Tendency	Concept of central tendency, Requirements of a good average. Arithmetic mean (A.M.): Definition, Properties of A.M. (Without proof), Combined A.M. Merits and Demerits, Numerical Problems. Median and Quartiles: Definitions, Merits and demerits of median. Numerical Problems. Definitions of Deciles and Percentiles. Mode: Definition, Merits and demerits, Empirical relation among mean, median and mode. Numerical Problem on Empirical relation.		15
Unit-II – Measures of Dispersion	Concept of dispersion, Requirements of a good measure of dispersion, Absolute and Relative measures of dispersion. Range, Coefficient of range, Merits and Demerits of range, Numerical Problems. Quartile Deviation (Q.D.), Coefficient of Q.D. Merits and Demerits of Q.D. Numerical Problems. Variance and Standard deviations (S.D.), Coefficient of S.D., Coefficient of variation, Merits and demerits of S.D., Numerical Problems.		15

Unit III- Analysis of Bivariate data: Correlation	Concept of correlation, Types of correlation. Methods of studying correlation: Scatted Plot, Karl Pearson's correlation coefficient (r), Spearman's Rank correlation coefficient (R), Interpretation of r (with special cases $r = -1, 0, +1$). Numerical Problems on computation of r and R (with and without ties) for ungrouped data.	15
Unit IV- Analysis of Bivariate data: Regression	Concept of Regression, Lines of Regression. Regression equations, regression coefficients, relation between correlation coefficients and regression coefficients, Properties of Regression Coefficients (Without proof), Numerical problems on ungrouped data.	15

Reference Books Recommended:

1. Gupta S.C. & Kapoor V.K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S.C. & Kapoor V.K.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta A.C.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Kenny & Keeping: Mathematics of Statistics Volume I and II, Van Nostran.
5. Gupta C.B. and Gupta Vijay (2004) An introduction to Statistical Methods, Vikas Publishing House Pvt. Limited.
6. Agrawal B. M. (2014) Essential of Business Statistics. Ane Books Pvt. Ltd.
7. B. L. Agrawal (2006) Basic Statistics. New Age International

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020)			
VERTICAL: MAJOR MANDATORY PAPER IV COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER – IV				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)	

Course Objectives:

After completion of this course the students enable to

1. Distinguish between random and non-random experiments,
2. Use the basic probability rules, including additive and multiplicative laws,
3. Understand concept of conditional probability and independence of events,
4. Understand the applications of Bayes' theorem.

Unit	Contents	Lectures
Unit I- Random Experiment and Sample Space	Sample space: Concepts of experiments and random experiments. Definitions of Sample space, discrete sample space (finite and countable infinite) and continuous sample space, Examples of Random experiments in real life. Events: Elementary event, Compound event. Algebra of events: Union, Intersection, Complementation of events. Definitions of mutually exclusive events, Exhaustive events, and equally likely events; impossible (null) event, certain (sure) event. Power set $P(\Omega)$ (sample space consisting at most 3 sample points). Symbolic representation of given events and description of events in symbolic form, Illustrative examples.	15
Unit II- Probability	Classical (a priori) definition of probability of an event; equiprobable sample space; simple numerical problems on computation of probability of the events based on permutations and combinations; Mathematical definition of probability; Definition of probability in terms of odds ratio with illustrative examples. Axiomatic definition of probability and proof of the results: i) $P(\Phi)=0$, ii) $P(A^c)=1- P(A)$, iii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (with proof) and its generalization (Statement only).	15

Unit III: Conditional Probability	Conditional Probability two events; Numerical problems on conditional probability Proof of the results: i) $P(A^c/B)=1-P(A/B)$, ii) $P[(A \cup B)/C]=P(A/C)+P(B/C)-P[(A \cap B)/C]$; iii) If $A \subset B$ then $P(A/B)=P(A)/P(B)$ iv) If $B \subset A$ then $P(A/B)=1$ Baye's theorem: Partition of sample space, Idea of posterior • Probability, Statement and Proof of Baye's theorem, illustrative examples on Baye's theorem.	15
Unit IV: Independence of Events and Baye's Theorem	Independence of events: Concept of independence of two events. Proof of the result that if A and B are independent then, i) A and B^c are independent, ii) A^c and B are independent, and iii) A^c and B^c are independent; Concept of Pair wise independence of events (only for three events); Concept of Mutual independence of events (only for three events); Numerical problems.	15

Books Recommended:

1. Agarwal B. L. (2003). Programmed Statistics, 2nd ed., New Age International (P), New Delhi
2. Gupta, S. C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, 8th Ed. Sultan Chand and Sons, New Delhi
3. Mood, A. M. and Graybill, F.A. and Boes D.C. (2017) Introduction to the Theory of Statistics, 3rd Ed., McGraw Hill Education (Indian Edition)
4. B. S. Prakash Rao (2010) First Course in Probability and Statistics, Cambridge University Press
5. Ross S. (2022) A First Course in Probability, 10th Ed., Pearson Education,
6. Rohatgi V. K. and Saleh A. K. Md. E. (2002): An Introduction to probability and statistics. John Wiley & Sons (Asia).
7. Bhat B. R. (2023) Modern Probability Theory: An Introductory Textbook 5th Ed. New Age International Publishers.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020)			
VERTICAL: MINOR- I COURSE CODE: COURSE NAME: Fundamental of Statistics –I				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)	

Course Objectives:

1. To understand the concept of central tendency and its importance in summarizing datasets.
2. To distinguish between absolute and relative measures of dispersion.
3. To Compute and interpret the correlation coefficients.
4. To understand the concept of regression analysis as a statistical technique used for Prediction.

Unit	Contents	Lectures
Unit I- Measures of Central Tendency	Concept of central tendency, Requirements of a good average. Arithmetic mean (A.M.): Definition, Properties of A.M. (Without proof), Combined A.M. Merits and Demerits, Numerical Problems. Median and Quartiles: Definitions, Merits and demerits of median. Numerical Problems. Definitions of Deciles and Percentiles. Mode: Definition, Merits and demerits, Empirical relation among mean, median and mode. Numerical Problem on Empirical relation.	15
Unit II- Measures of Dispersion	Concept of dispersion, Requirements of a good measure of dispersion, Absolute and Relative measures of dispersion. Range, Coefficient of range, Merits and Demerits of range, Numerical Problems. Quartile Deviation (Q.D.), Coefficient of Q.D., Merits and Demerits of Q.D. Numerical Problems. Variance and Standard deviations (S.D.), Coefficient of S.D., Coefficient of variation, Merits and demerits of S.D., Numerical Problems.	15

Topic III: Analysis of Bivariate data: Correlation	Concept of correlation, Types of correlation. Methods of studying correlation: Scatted Plot, Karl Pearson's correlation coefficient (r), Spearman's Rank correlation coefficient (R), Interpretation of r (with special cases $r = -1, 0, +1$). Numerical Problems on computation of r and R (with and without ties) for ungrouped data.	15
Topic IV: Analysis of Bivariate data: Regression	Concept of Regression, Lines of Regression. Regression equations, regression coefficients, relation between correlation coefficients and regression coefficients, Properties of Regression Coefficients (Without proof), Numerical problems on ungrouped data.	15

Reference Books Recommended:

1. Gupta S. C. & Kapoor V. K. : Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S. C. & Kapoor V. K.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta A. C. :Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Kenny & Keeping: Mathematics of Statistics Volume I and II, Van Nostran.
5. Gupta C.B. and Gupta Vijay(2004) An introduction to Statistical Methods, Vikas Publishing House Pvt. Limited.
6. Agrawal B. M. (2014) Essential of Business Statistics. Ane Books Pvt. Ltd.
7. B. L. Agrawal (2006) Basic Statistics. New Age International

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020) w.e.f. 2025-26			
VERTICAL: Open Elective 5 COURSE CODE: COURSE NAME: Applied Statistics -I				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
2 Credits	2 Hours	30 Hours	50 (30 UA+ 20 CA)	

Course Objectives:

1. To identify different components of time series as well as and to measure trend component.
2. To compute various types of index numbers.

Unit	Contents	Lectures
Unit I- Time series	Definitions and uses of time series, Components of time series: Secular Trend, Seasonal variations, Cyclical variations and Irregular variations. Methods of measuring trend: Free hand or Graphic method, Method of Semi-Averages, Methods of Moving Averages. Merits and Limitations of all these methods. Illustrative Examples.	15
Unit II- Index Number	Definition, Characteristics, Limitation and use of index numbers. Problem in the Construction of Index number, Price relative, Quantity relative and Value relative, Applications of Index Numbers in Share Market. Price, Quantity and Value Index number. Methods of Construction Index Numbers: Unweighted Index Number: Simple Aggregative method, Simple average of Relatives method. Merits and Limitations of this method. Weighted Index Number: Weighted Aggregate Method, Weighted average of relative method. Illustrative Examples.	15

Books Recommended:

1. Gupta S.C. & Kapoor V.K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S. C. & Kapoor V. K. : Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta A. C.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Kenny & Keeping: Mathematics of Statistics Volume I and II, VanNostran.
5. Ken Blank: Business Statistics, Willey India (P.) Ltd., New Delhi.
6. Goon Gupta & Dasgupta: Fundamental of Statistics Volume I and II, World Press, Calcutta.
7. Spiegel M. R.: Theory and Problems of Statistics, McGraw Hill Book Co., London.
8. Shenoy G.V., Srivastava U. K. & Sharma S. C.: Business Statistics, Wiley Eastern.
9. Das G. & Patnaik: Fundamentals of Mathematical Analysis, Tata McGraw Hill, New Delhi.
10. D. N. Elance (1956): Fundamentals of Statistics Kitab Mahal, Allahabad.
11. D. C. Sancheti and V. K. Kapoor: Statistics (Theory and Application), Sultan Chand & Sons Publication, New Delhi.
12. Meyer P. L. (1970): Introductory Probability and statistical application, Addison Wesley.
13. De Groot M. H. (1975): Probability and Statistics, Addison Wesley. Mood A. M. Graybill F. A .and Bose D. C. (1974): Introduction to the theory of Statistics, McGraw Hill.
14. Rohatgi V. K. (1986): An introduction to probability theory and Mathematical statistics, Wiley Eastern.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020) w.e.f. 2025-26			
VERTICAL: VOCATIONAL SKILL COURSE- P-II COURSE CODE: COURSE NAME: Practical Paper-III				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
2 Credits	2 Hours practical	30 Hours	50 (30 UA Practical+ 20 CA)	

Course Objectives:

1. To Calculate mean, median and mode for given datasets.
2. To apply measures of dispersion in real life data analysis.

	List of Practical	Hours
	1. Computation of Mean, Median and Mode-I (Discrete Frequency Distributions) 2. Computation of Mean, Median and Mode -II (Continuous Frequency Distributions) 3. Computation of Range and Quartile Deviation -I (Discrete Frequency Distributions) 4. Computation of Range and Quartile Deviation -II (Continuous Frequency Distributions) 5. Computation of Variance and Standard Deviation-I (Discrete Frequency Distributions) 6. Computation of Karl Pearson's Correlation coefficient and Rank Correlation coefficient. 7. Computation of regression.	30

Evaluation Scheme

University Practical examination will be conducted for 30 marks and is of two hours duration. There shall be 05 questions each of 08 marks, of which student has to attempt any 03 questions. VIVA will be for 06 marks.

Reference Books Recommended:

1. Agarwal B. L.: Programmed Statistics, New Age International Limited, New Delhi fourth Edition, 2021
2. Gupta S. C. & Kapoor V. K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta S. C. & Kapoor V. K.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Gupta A. C.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
5. Kenny & Keeping: Mathematics of Statistics Volume I and II, Van Nostran.
6. Ken Blank: Business Statistics, Willey India (P.)Ltd., New Delhi.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – III (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER V COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER – V			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)

Course Objectives:

1. To apply formulas for permutations and combinations.
2. To define probability and understand its fundamental principle.
3. To solve problems involving the binomial distribution.
4. To Compute and interpret control limits for different types of Control chart.

Unit	Contents	Lectures
Unit I- Permutation and Combination	Factorial, Results of Factorial, Introduction to Permutation and Combination, Definition and application of the counting principle. Multiplication rule for counting, Factorial notation and basic operations with factorials. Formula for permutations when some objects are repeated. Example problems: arranging letters, numbers, or statistical data points. Basic Combination Formula, sampling problems, constructing sample sets, and understanding combinatorial probability. Numerical Examples.	15
Unit II- Introduction to Probability	Definitions and examples -Experiment, Sample space, Event, mutually exclusive events, equally likely events, Exhaustive events, Sure event, Null event, Complementary event and independent events. Mathematical definition of probability, Definition of Conditional Probability. Statements of Addition and Multiplication laws of probability. Problems on Probabilities, Conditional probabilities, Probabilities using Addition and Multiplication laws of probabilities (without use of permutations and combinations).	15

Unit III: Probability Distributions: Binomial And Normal distribution	Definitions- Random Variable, Discrete and Continuous random variables, Probability mass function (p. m. f.), Probability density function (p. d. f.). Binomial Distribution: - Probability mass function (p. m. f.) of binomial distribution with parameters n and p. Mean, Variance and S.D. of binomial distribution (without proof). Examples of real-life situations where binomial distribution is applicable. Numerical problems on binomial distribution. Normal Distribution: -Probability density function (p. d. f.) of Normal distribution with parameters μ and σ^2. Notation: $X \sim N(\mu, \sigma^2)$. Properties of Normal distribution. Numerical problems on Normal distribution.	15
Unit IV: Statistical Quality Control (S.Q.C)	Meaning of quality. Meaning of SPC. Chance and Assignable causes of variations. Meaning of Process control and Product control. Procedure of construction of Shewhart's control chart. Types of Shewhart's control charts- i) Control charts for Mean and Range. ii) Control chart for number of defectives (d-chart or np-chart) for a fixed sample size. iii) Control chart for number of defects per unit(c-chart). Numerical problems on the construction of the above charts.	15

Reference Books Recommended:

1. Gupta S.C.& Kapoor V.K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S.C. & Kapoor V. K.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta A.C.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Kenny & Keeping: Mathematics of Statistics Volume I and II, VanNostran.
5. Gupta C.B. and Gupta Vijay (2004) An introduction to Statistical Methods, Vikas Publishing House Pvt. Limited.
6. Agrawal B.M. (2014) Essential of Business Statistics. Ane Books Pvt. Ltd.
7. B.L.Agrawal (2006) Basic Statistics. New Age International.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ (विद्यया सेवन्ता) NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – IV (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -VI COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER VI			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)
Course Objectives: 1. Understand discrete random variable, probability distribution. 2. Understand the concept of mathematical expectation, mean and variance, p. g. f. 3. Understand random variables assuming finite values and their probability distribution such as – discrete uniform, Binomial and Hyper geometric distributions. 4. Understand random variables assuming countable infinite values and their probability distribution such as –Poisson, Geometric and Negative Binomial distributions.			
Unit	Contents		Lectures
Unit I- Univariate Probability Distributions (finite sample space)	Definition of discrete random variable. Probability mass function (p. m. f.) and cumulative distribution function (c. d. f.) of a discrete random variable, Properties of c. d. f.(statements only). Probability distribution of function of random variable. Median and mode: Median and mode of a univariate discrete probability distribution. Examples.		15
Unit-II – Mathematical expectation (Univariate random variable)	Definition of expectation of a random variable. Expectation of a function of a random variable, Results on expectation of a functions of a random variable i) $E(c) = c$, where c is a constant, ii) $E(aX + b) = aE(X) + b$, where a and b are constants, Mean and variance: Definitions of mean and variance of univariate distribution, $V(aX + b) = a^2 V(X)$, Raw and central moments: Definition of raw and central moments. Probability generating function (p. g. f.): Definition of probability generating function (p. g. f.) of a random variable.		15
Unit III Discrete probability distributions defined on finite support	Discrete uniform distribution: p.m.f., c.d.f., mean and variance. Hyper geometric distribution: p.m.f., mean and variance. Bernoulli distribution: p.m.f., p.g.f., mean and variance. Binomial distribution: p.m.f., p.g.f., mean and variance. Additive property of Binomial distribution (Statement Only). Binomial distribution as a limiting case of Hyper geometric distribution (Statement Only); Illustrative Examples for the above distributions.		15

Unit IV Discrete probability distributions defined on countable infinite support	Poisson distribution: p.m.f., p.g.f., mean and variance. Additive property of Poisson distribution (Statement Only). Poisson distribution as a limiting case of Binomial distribution (Statement Only); Geometric distribution: p.m.f., c.d.f., p.g.f., mean and variance. Negative Binomial distribution: p.m.f., p.g.f., mean and variance. Illustrative examples for the above distributions.	15
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Books Recommended:

1. Gupta S.C.& Kapoor V.K.: Fundamentals of Mathematical Statistics. Sultan Chand & sons, New Delhi.
2. Goon, A.M., Gupta M.K. and Dasgupta B: Fundamentals of Statistics Vol. I and Vol. II World Press, Calcutta.
3. Hogg R.V. and Criag A.T.: Introduction to Mathematical Statistics (Third edition), Macmillan Publishing, New York.
4. Mood A.M., Gray bill F.A.: Introduction to theory of Statistics. Boes D. C. Tata, Mc Graw Hill, New Delhi. (Third Edition)
5. Parimal Mukhopadhyaya: An Introduction to theTheory of Probability. World Scientific Publishing.
6. Walpole R.E. & Mayer R.H.: Probability & Statistics, Mac Millan Publishing Co.Inc, New York.
7. Chougule, P.S.et.al.: Textbook on Business Statistics Paper II for B.Com.II (Sem IV), Nirali Prakashan (2023).
8. Patil, P.Y.and Patil S.B.:Textbook on DSC–IV:DISCRETE PROBABILITY DISTRIBUTIONS for B Sc I (Sem II) , Shivaji University Press Kolhapur.
9. Patil, P.Y.: Statistics Practical Work book with Solutions for BSc I (Statistics), Rupl Publications Pvt. Ltd.



**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY,
SOLAPUR**

PROGRAMME: B.COM. (BUSINESS STATISTICS)

B.COM. - II SEMESTER – IV (NEP 2020)



VERTICAL: MINOR- II

COURSE CODE:

COURSE NAME: FUNDAMENTALS OF STATISTICS - II

Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)

Course Objectives:

- To apply formulas for permutations and combinations.
- To define probability and understand its fundamental principle.
- To solve problems involving the binomial distribution.
- To Compute and interpret control limits for different types of Control chart.

Unit	Contents	Lectures
Unit I- Permutation and Combination	Factorial, Results of Factorial, Introduction to Permutation and Combination, Definition and application of the counting principle. Multiplication rule for counting, Factorial notation and basic operations with factorials. Formula for permutations when some objects are repeated. Example problems: arranging letters, numbers, or statistical data points. Basic Combination Formula, sampling problems, constructing sample sets, and understanding combinatorial probability. Numerical Examples.	15
Unit II- Introduction to Probability	Definitions and examples -Experiment, Sample space, Event, mutually exclusive events, equally likely events, Exhaustive events, Sure event, Null event, Complementary event and independent events. Mathematical definition of probability, Definition of Conditional Probability. Statements of Addition and Multiplication laws of probability. Problems on Probabilities, Conditional probabilities, Probabilities using Addition and Multiplication laws of probabilities (without use of permutations and combinations).	15

Unit III: Probability Distributions: Binomial And Normal distribution	Definitions- Random Variable, Discrete and Continuous random variables, Probability mass function (p. m. f.), Probability density function (p. d. f.). Binomial Distribution: - Probability mass function (p. m. f.) of binomial distribution with parameters n and p. Mean, Variance and S.D. of binomial distribution (without proof). Examples of real-life situations where binomial distribution is applicable. Numerical problems on binomial distribution. Normal Distribution: -Probability density function (p. d. f.) of Normal distribution with parameters μ and σ^2. Notation: $X \sim N(\mu, \sigma^2)$. Properties of Normal distribution. Numerical problems on Normal distribution.	15
Unit IV: Statistical Quality Control (S.Q.C)	Meaning of quality. Meaning of SPC. Chance and Assignable causes of variations. Meaning of Process control and Product control. Procedure of construction of Shewhart's control chart. Types of Shewhart's control charts- i) Control charts for Mean and Range. ii) Control chart for number of defectives (d-chart or np-chart) for a fixed sample size. iii) Control chart for number of defects per unit(c-chart). Numerical problems on the construction of the above charts.	15

Reference Books Recommended:

1. Gupta S.C.& Kapoor V.K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S.C. & Kapoor V. K.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
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4. Kenny & Keeping: Mathematics of Statistics Volume I and II, VanNostran.
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6. Agrawal B.M. (2014) Essential of Business Statistics. Ane Books Pvt. Ltd.
7. B.L.Agrawal (2006) Basic Statistics. New Age International.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संवत्सरा ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – IV (NEP 2020) w.e.f. 2025-26		
VERTICAL: OPEN ELECTIVE COURSE CODE: COURSE NAME: APPLIED STATISTICS -II			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
2 Credits	2 Hours	30 Hours	50 (30 UA+ 20 CA)

Course Objectives:

1. To introduce students to the meaning, scope, and importance of event management.
2. To explore different categories of events
3. To provide students with insights into the roles, responsibilities, and duties of an event planner.
4. To familiarize students with the step-by-step event management process.
5. To understand the role of technology in enhancing the efficiency and effectiveness of event planning and execution.

Unit	Contents	Lectures
Unit I- Correlation and Regression	Concept of correlation, Types of correlation. Methods of studying correlation: Scatted Plot, Karl Pearson's correlation coefficient (r), Spearman's Rank correlation coefficient (R), Interpretation of r (with special cases $r = -1, 0, +1$). Numerical Problems on computation of r and R (with and without ties) for ungrouped data. Concept of Regression, Lines of Regression. Regression equations, regression coefficients, relation between correlation coefficients and regression coefficients, Properties of Regression Coefficients (Without proof), Numerical problems on ungrouped data.	15
Unit II- Statistical Quality Control (S.Q.C)	Meaning of quality. Meaning of SPC. Chance and Assignable causes of variations. Meaning of Process control and Product control. Procedure of construction of Shewhart's control chart. Types of Shewhart's control charts- i) Control charts for Mean and Range. ii) Control chart for number of defectives (d- chart or np - chart) for a fixed sample size. iii) Control chart for number of defects per unit (c-chart). Numerical problems on the construction of the above Charts.	15

Books Recommended:

1. Gupta S.C. & Kapoor V.K.: Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Gupta S. C. & Kapoor V. K. : Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
3. Gupta A. C.: Fundamental of Applied Statistics, Sultan Chand & Sons, New Delhi.
4. Kenny & Keeping: Mathematics of Statistics Volume I and II, VanNostran.
5. Ken Blank: Business Statistics, Willey India (P.) Ltd., New Delhi.
6. Goon Gupta & Dasgupta: Fundamental of Statistics Volume I and II, World Press, Calcutta.
7. Spiegel M. R.: Theory and Problems of Statistics, McGraw Hill Book Co., London.
8. Shenoy G.V., Srivastava U. K. & Sharma S. C.: Business Statistics, Wiley Eastern.
9. Das G. & Patnaik: Fundamentals of Mathematical Analysis, Tata McGraw Hill, New Delhi.
10. D. N. Elance (1956): Fundamentals of Statistics Kitab Mahal, Allahabad.
11. D. C. Sancheti and V. K. Kapoor: Statistics (Theory and Application), Sultan Chand & Sons Publication, New Delhi.
12. Meyer P. L. (1970): Introductory Probability and statistical application, Addison Wesley.
13. De Groot M. H. (1975): Probability and Statistics, Addison Wesley. Mood A. M. Graybill F. A. and Bose D. C. (1974): Introduction to the theory of Statistics, McGraw Hill.
14. Rohatgi V. K. (1986): An introduction to probability theory and Mathematical statistics, Wiley Eastern.

 पुन्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - II SEMESTER – IV (NEP 2020) w.e.f. 2025-26		
VERTICAL: SKILL ENHANCEMENT COURSE COURSE CODE: COURSE NAME: Practical Using MS-Excel			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
2 Credits	2 Hours	30 Hours	50 (30 UA Practical+ 20 CA)

Course Objectives:

1. To Calculate mean, median and mode for given data sets using MS-Excel.
2. To apply measures of dispersion in real life data analysis using MS-Excel.

	List of Practical	Lectures
	Note: - Complete the entire following Practical's by using MS-Excel. 1. Computation of Mean, Median and Mode-I (Discrete Frequency Distributions) 2. Computation of Mean, Median and Mode -II (Continuous Frequency Distributions) 3. Computation of Range and Quartile Deviation-I (Discrete Frequency Distributions) 4. Computation of Range and Quartile Deviation-II (Continuous Frequency Distributions) 5. Computation of Variance and Standard Deviation-I (Discrete Frequency Distributions) 6. Computation of Karl Pearson's Correlation coefficient and Rank Correlation coefficient. 7. Computation of regression.	30

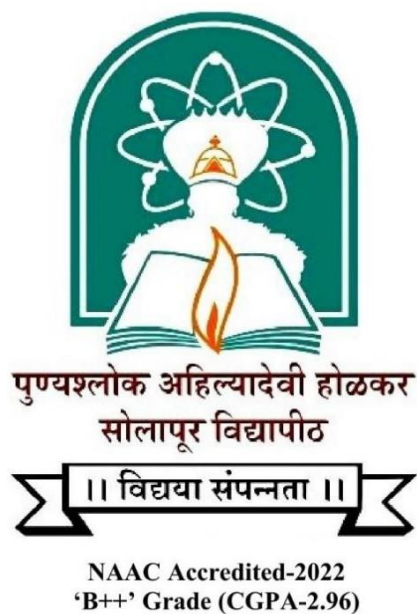
Evaluation Scheme

University Practical examination will be conducted for 30 marks and is of two hours duration. There shall be 05 questions each of 08 marks, of which student has to attempt any 03 questions. VIVA will be for 06 marks.

Reference Books Recommended:

1. Agarwal B.L.: Programmed Statistics, New Age International Limited, New Delhi fourth Edition, 2021
2. Kieran Healy, Data Visualization A Practical Introduction, Princeton University Press, 2018
3. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly Media, 1st edition, 2019
4. Dr. B. G. Kore, MS-Excel for data Analysis, Nirali Prakashan
5. David M Lovino, Statistics for Managers using Micro soft Excel, Pearson

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR
UNIVERSITY, SOLAPUR**



Name of the Faculty-Commerce and Management

Syllabus-NEP 2020

Name of the Course- B.Com. -III- Semester V and VI

B.Com. (Business Statistics)

With effect from June-2026

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

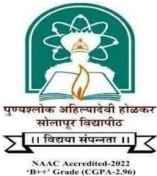
FACULTY: COMMERCE AND MANAGEMENT

PROGRAMME: B.COM. (BUSINESS STATISTICS)

B.COM. - III SEMESTER – V AND VI (NEP 2020) W.E.F. JUNE 2026



Sr. No	Category	Title of the Subject	Course Credit	Weekly Hours	Total Lectures	Total Marks		
						UA	CA	Total
Semester V								
1	Major Mandatory	Business Statistics Paper VII	04	04	60	60	40	100
2	Major Mandatory	Business Statistics Paper VIII	04	04	60	60	40	100
3	Major Mandatory	Business Statistics Paper IX	02	02	30	30	20	50
4	Minor	Fundamental of Statistics-III	04	04	60	60	40	100
5	Elective	Risk Analysis and Insurance Statistics	04	04	60	60	40	100
		Official Statistics	04	04	60	60	40	100
6	Vocational Skill Course VSC (Practical)	Introduction to R - Programming	02	02	30 (Practical)	30 (Practical)	20	50
7	Field Project /CEP		02	02	30	30	20	50
Semester VI								
1	Major Mandatory	Business Statistics Paper X	04	04	60	60	40	100
2	Major Mandatory	Business Statistics Paper XI	04	04	60	60	40	100
3	Major Mandatory	Business Statistics Paper XII	02	02	30	30	20	50
4	Minor	Fundamental of Statistics-IV	04	04	60	60	40	100
5	Elective	Inventory Analysis	04	04	60	60	40	100
		Data Mining	04	04	60	60	40	100
6	OJT		04	04	60	60	40	100

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.56)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -VII COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER- VII			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100
Course Objectives: 1. To formulate LPP and to solve it. 2. To understand concept of assignment problem and its applications. 3. To acquire the knowledge of transportation problem and its solution. 4. To accomplish the allotment of jobs to machines in order to minimize the processing time.			
Unit	Contents		Lectures
Unit I- Linear Programming Problems	Formulation of LPP, Solving LPP using Graphical Method, LPP with more than two variables. Use of slack, surplus and artificial variables, Solution of LPP of maximization / minimization type problems by using Simplex method and Big-M method. Examples.		15
Unit II- Assignment Problems	Definition and formulation of assignment problems, Balanced and unbalanced assignment problems, Solution using Hungarian Method, Maximization assignment problems, Prohibited assignments, Use of dummy rows/columns. Examples.		15
Unit III- Transportation Problems	Definition and formulation of transportation problems, Balanced and unbalanced transportation problems, Initial basic feasible solutions using North-West Corner Rule, Least Cost Method and Vogel's Approximation Method (VAM), Optimal solution using MODI method, Degeneracy in transportation problems. Examples.		15
Unit IV- Sequencing	Introduction to sequencing and scheduling, Processing of n jobs through 2 machines using Johnson's Rule, Processing of n jobs through 3 machines, Processing of n jobs through m machines, Calculation of total elapsed time and idle time, Scheduling charts. Examples.		15

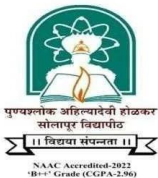
Reference Books Recommended:

- 1) Fundamentals of Applied Statistics by Gupta & Kapoor
- 2) Operations Research by S. D. Sharma
- 3) Quantitative Techniques in Decision Making by J. K. Sharma
(This book is widely used for understanding OR concepts and problem-solving methods)
- 4) Operations Research by R. K. Gupta
- 5) Statistical Methods by J. Medhi
- 6) Fundamentals of Mathematical Statistics by Gupta & Kapoor
- 7) Introduction to Mathematical Statistics by D. N. Elhance
- 8) Operations Research by Hamdy A. Taha
- 9) Introduction to Operations Research by Frederick S. Hillier and Gerald J. Lieberman
- 10) Linear Programming and Operations Research by Kanti Swarup, P. K. Gupta, and Man Mohan
- 11) Operations Research Problems and Solutions by V. K. Kapoor

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.56)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -VIII COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER -VIII			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100
Course Objectives: 1. To explain the concept of bivariate distributions and understand joint, marginal, and conditional probability distributions. 2. To estimate regression coefficients using the least squares method for simple and multiple regression models and apply them in real-life business problems. 3. To apply Sign Test, Wilcoxon Signed-Rank Test, and Run Test to paired or matched data and interpret the results in research problems. 4. To apply Mann-Whitney U Test, Median Test, and Chi-Square Test for independent samples or categorical data.			
Unit	Contents		Lectures
Unit I- Bivariate Probability Distribution	Concept of bivariate distribution, Joint probability distribution, Marginal and conditional distributions, Expectation, Covariance, Correlation coefficient, Properties, and Examples.		15
Unit II- Regression	Introduction to regression analysis, Difference between correlation and regression, Simple linear regression, least squares method, Estimation of regression coefficients, Multiple regression (basic concept), Applications and Examples.		15
Unit III- Non-parametric Tests – I	Introduction to non-parametric tests, Advantages and limitations, Sign test, Wilcoxon Signed-Rank Test, Run test (Test for randomness), Applications with Examples.		15
Unit IV- Non-parametric Tests – II	Mann-Whitney U Test, Median Test, Chi-Square Test for goodness-of-fit and independence, Examples and Applications in Research Problems.		15

Reference Books Recommended:

- 1) Fundamentals of Applied Statistics by Gupta & Kapoor
- 2) Operations Research by S. D. Sharma
- 3) Quantitative Techniques in Decision Making by J. K. Sharma
(This book is widely used for understanding OR concepts and problem-solving methods)
- 4) Operations Research by R. K. Gupta
- 5) Statistical Methods by J. Medhi
- 6) Fundamentals of Mathematical Statistics by Gupta & Kapoor
- 7) Introduction to Mathematical Statistics by D. N. Elhance
- 8) Operations Research by Hamdy A. Taha
- 9) Introduction to Operations Research by Frederick S. Hillier and Gerald J. Lieberman
- 10) Linear Programming and Operations Research by Kanti Swarup, P. K. Gupta, and Man Mohan
- 11) Operations Research Problems and Solutions by V. K. Kapoor

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -IX COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER - IX			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
2 Credits	2 Hours	30 Hours	50 (UA 30 + CA 20)
Course Objectives: 1. To apply methods of trend analysis, including Progressive Average and Least Squares Method, for estimating and projecting business trends. 2. To measure and interpret seasonal variations using Simple Average and Ratio-to-Moving Average methods.			
Unit	Contents		Lectures
Unit I- Trend Projection and Business Applications	Progressive average method, Least Squares Method, Trend Projection, Forecasting using Trend Equation, Business Applications of Time Series, Advantages and Limitations. Illustrative Examples.		15
Unit II- Seasonal Variations	Meaning, Importance and Seasonal Indices. Methods of Measuring Seasonal Variations: Simple Average Method and Ratio-to-Moving Average Method. Interpretation and Business Applications of Seasonal Indices. Merits and Limitations of the Methods. Illustrative Examples.		15

Reference Books Recommended:

- 1) Gupta, S. C. & Kapoor, V. K. **Fundamentals of Applied Statistics**. Sultan Chand & Sons, New Delhi.
- 2) Gupta, S. C. & Kapoor, V. K. **Fundamentals of Mathematical Statistics**. Sultan Chand & Sons, New Delhi.
- 3) Kenney, J. F. & Keeping, E. S. **Mathematics of Statistics**, Volumes I & II. Van Nostrand.
- 4) Goon, A. M., Gupta, M. K. & Dasgupta, B. **Fundamentals of Statistics**, Volumes I & II. World Press, Kolkata.
- 5) Spiegel, M. R. **Theory and Problems of Statistics**. McGraw-Hill Book Company.
- 6) Shenoy, G. V., Srivastava, U. K. & Sharma, S. C. **Business Statistics**. Wiley Eastern Limited.
- 7) Elhance, D. N. **Fundamentals of Statistics**. Kitab Mahal, Allahabad.
- 8) Sancheti, D. C. & Kapoor, V. K. **Statistics (Theory and Applications)**. Sultan Chand & Sons, New Delhi.
- 9) Levin, R. I. & Rubin, D. S. **Statistics for Management**. Pearson Education.
- 10) Anderson, D. R., Sweeney, D. J. & Williams, T. A. **Statistics for Business and Economics**. Cengage Learning.
- 11) Gupta, S. P. **Statistical Methods**. Sultan Chand & Sons, New Delhi.
- 12) Sharma, J. K. **Business Statistics**. Pearson Education.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)		
VERTICAL: MINOR COURSE CODE: COURSE NAME: Fundamental of Statistics -III			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)

Course Objectives:

1. To formulate LPP and to solve it.
2. To understand concept of assignment problem and its applications.
3. To acquire the knowledge of transportation problem and its solution.
4. To accomplish the allotment of jobs to machines in order to minimize the processing time.

Unit	Contents	Lectures
Unit I- Linear Programming Problems	Formulation of LPP, Solving LPP using Graphical Method, LPP with more than two variables. Use of slack, surplus and artificial variables, Solution of LPP of maximization / minimization type problems by using Simplex method and Big-M method. Examples.	15
Unit II- Assignment Problems	Definition and formulation of assignment problems, Balanced and unbalanced assignment problems, Solution using Hungarian Method, Maximization assignment problems, Prohibited assignments, Use of dummy rows/columns. Examples.	15
Unit III- Transportati on Problems	Definition and formulation of transportation problems, Balanced and unbalanced transportation problems, Initial basic feasible solutions using North-West Corner Rule, Least Cost Method and Vogel's Approximation Method (VAM), Optimal solution using MODI method, Degeneracy in transportation problems. Examples.	15

Unit IV- Sequencing	Introduction to sequencing and scheduling, Processing of n jobs through 2 machines using Johnson's Rule, Processing of n jobs through 3 machines, Processing of n jobs through m machines, Calculation of total elapsed time and idle time, Scheduling charts. Examples.	15
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Reference Books Recommended:

- 1) Fundamentals of Applied Statistics by Gupta & Kapoor
- 2) Operations Research by S. D. Sharma
- 3) Quantitative Techniques in Decision Making by J. K. Sharma
(*This book is widely used for understanding OR concepts and problem-solving methods*)
- 4) Operations Research by R. K. Gupta
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- 6) Fundamentals of Mathematical Statistics by Gupta & Kapoor
- 7) Introduction to Mathematical Statistics by D. N. Elhance
- 8) Operations Research by Hamdy A. Taha
- 9) Introduction to Operations Research by Frederick S. Hillier and Gerald J. Lieberman
- 10) Linear Programming and Operations Research by Kanti Swarup, P. K. Gupta, and Man Mohan
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 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.86)	PUNYASHLOKAHILYADEVIHOLKARSOLAPURUNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)			
VERTICAL: Discipline Specific Elective 1 (A) COURSE CODE: COURSE NAME: Risk Analysis and Insurance Statistics				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
04 Credits	04 Hours	60 Hours	100 (UA 60 + CA 40)	

Course Objectives:

5. To understand the concept of risk, its types, and methods of risk analysis and management.
6. To develop knowledge about insurance principles, functions, and different types of insurance policies.
7. To apply statistical techniques in insurance, including life tables, mortality analysis, and premium calculations.
8. To introduce basic concepts of actuarial science and its practical applications in insurance.

Unit	Contents	Lectures
Unit-I Concept of Risk and Risk Analysis	Meaning and definition of risk, Types of risk (Pure, Speculative, Static, Dynamic), Risk vs Uncertainty, Perils and Hazards, Risk identification and classification, Risk analysis and assessment, Risk measurement techniques, Risk management methods (avoidance, reduction, transfer, retention), Examples and applications.	15
Unit-II Insurance: Basic Concepts and Types	Meaning, nature and scope of insurance, Functions and importance, Insurance vs Assurance vs Gambling, Principles of pooling of risk, Types of insurance: Life insurance, Fire insurance, Marine insurance, Motor and Health insurance, Role of insurance in economic development, Examples.	15
Unit-III Principles of Insurance and Insurance Contracts	Nature of insurance contracts, Principles of insurance: Utmost good faith, Insurable interest, Indemnity, Subrogation, Contribution, Proximate cause, Policy conditions, Legal aspects of insurance, Claim settlement procedures, Examples.	15
Unit-IV Insurance Statistics and Actuarial Concepts	Role of statistics in insurance, Mortality and survival analysis, Construction of life tables, Expectation of life, Premium calculation (Net and Gross premium), Annuities, Present value concepts, Risk modelling, Claim analysis, Introduction to actuarial science, Practical examples.	15

Reference Books Recommended:

1. Risk Analysis in Finance and Insurance – Alexander Melnikov, Routledge Publications, 2004
2. Statistical and Probabilistic Methods in Actuarial Science – Philip J. Boland, Chapman & Hall/CRC, 2007
3. Risk and Insurance – Søren Asmussen & Mogens Steffensen, Springer Publications, 2020
4. Introductory Statistics with Applications in General Insurance – I.B. Hossack, J.H. Pollard & B. Zehnwirth, Cambridge University Press, 1999
5. Fundamentals of Actuarial Mathematics – S. David Promislow, Wiley Publications, 2015
6. Actuarial Mathematics for Life Contingent Risks – David C.M. Dickson, Mary R. Hardy & Howard R. Waters, Cambridge University Press, 2013
7. Risk Theory and Insurance – Hans U. Gerber, Springer Publications, 1997
8. Insurance Principles and Practice – M.N. Mishra & S.B. Mishra, S. Chand & Company Ltd., New Delhi
9. Principles of Risk Management and Insurance – George E. Rejda & Michael McNamara, Pearson Education, 2017
10. Fundamentals of Risk and Insurance – Emmett J. Vaughan & Therese Vaughan, Wiley Publications, 2014

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संयन्ता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOKAHILYADEVIIHOLKARSOLAPURUNIVERSITY, SOLAPUR		
PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)			
VERTICAL: Discipline Specific Elective 1 (B) COURSE CODE: COURSE NAME: Official Statistics			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
04 Credits	04 Hours	60 Hours	100 (UA 60 + CA 40)

Course Objectives:

1. To understand the concept and importance of official statistics in government planning.
2. To study various sources of statistical data in India.
3. To analyse population, economic, and social statistics.
4. To understand the role of national organizations in data collection and dissemination.

Unit	Contents	Lectures
Unit-I Introduction to Official Statistics	Meaning and definition of Official Statistics, Importance and scope, Sources of official statistics in India, Role of government in data collection, Statistical system in India, Functions of Central Statistics Office (CSO) and National Sample Survey Office (NSSO), Uses and limitations of official statistics.	15
Unit-II Population Statistics	Sources of population data, Census of India – objectives and features, Vital statistics, Measures of fertility and mortality, Population growth, Density, Sex ratio, Literacy rate, Uses of population statistics in planning and policy making.	15
Unit-III Economic Statistics	National income concepts, Methods of measuring national income, Role of Reserve Bank of India (RBI) in data collection, Index numbers (CPI, WPI), Inflation and deflation, Agricultural and industrial statistics, Sources of economic data in India.	15
Unit-IV Social and Industrial Statistics	Statistics related to education, health, employment and unemployment, Poverty and inequality measures, Labour statistics, Industrial production statistics, Role of Ministry of Statistics and Programme Implementation (MOSPI), Applications of official statistics in governance and research. science, Practical examples.	15

Reference Books Recommended:

1. Basic Statistics – B.L. Agarwal, New Age International Publishers
2. Fundamentals of Applied Statistics – S.C. Gupta & V.K. Kapoor, Sultan Chand & Sons, New Delhi
3. Statistical Methods – S.P. Gupta, Sultan Chand & Sons
4. Official Statistics – M. Mukhopadhyay, New Central Book Agency
5. Indian Official Statistics – Ministry of Statistics and Programme Implementation Publications
6. Reports and Publications – Reserve Bank of India
7. Census Reports – Census of India

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 B++ Grade (CGPA-2.56)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – V (NEP 2020)		
VERTICAL: Vocational Skill Course COURSE CODE: COURSE NAME: Introduction to R-Programming (Practical)			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
2 Credits	2 Hours	30 Hours	50 (UA 30 + CA 20)
Course Objectives: 1. To introduce students to the basics of R 2. To develop skills in data input and data handling 3. To enable graphical representation of data using charts and diagrams 4. To understand and compute measures of central tendency			
Unit	Contents		Lectures
Unit-I Introduction to R and Data Handling	Introduction to R Environment and Basic Commands. Creation of Vectors using c() , rep() , seq() functions. Data Input using scan() function. Creation and Editing of Data Frames using data.frame() and edit() functions. Basic Data Handling, Data Viewing Techniques, Arithmetic Operations on Vectors (Addition, Subtraction, Multiplication and Division), Element-wise Operations, Logical and Relational Operations on Vectors.		15
Unit-II Data Visualization and Statistical Analysis using R	Diagrammatic Representation of Data: Simple Bar Diagram, Subdivided (Component) Bar Diagram, Pie Diagram. Graphical Representation of Data: Histogram, Frequency Polygon, Ogive Curves (Less than and more than). Statistical Analysis using R: Measures of Central Tendency (Mean, Median, Partition Values and Mode), Measures of Dispersion (Range, Variance, Standard Deviation and Quartile Deviation).		15

Evaluation Scheme

University Practical examination will be conducted for 30 marks and is of one and half hour's duration. There shall be 05 questions each of 08 marks, of which student has to attempt any 03 questions. VIVA will be for 06 marks.

Suggested Readings:

1. The R Book – Wiley Publications
2. R for Data Science – O'Reilly Media
3. Introductory Statistics with R – Springer
4. R – Official Documentation
5. RStudio – User Guide / Documentation

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER -X COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER- X			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100
Course Objectives: 1. To introduce the concepts of hypothesis, null and alternative hypotheses, and significance of testing. 2. To perform large sample tests (Z-tests) and interpret results. 3. To understand and apply exact sampling distributions (t, F, χ^2) in practical problems. 4. To develop analytical and decision-making skills through statistical inference.			
Unit	Contents		Lectures
Unit I- Testing of Hypothesis	Meaning and definition of hypothesis, Null and Alternative Hypothesis, Steps in hypothesis testing, Types of errors (Type I & Type II), Level of significance, One-tailed and two-tailed tests, Uses and limitations of hypothesis testing.		15
Unit II- Large Sample Tests	Z-test for population mean (known variance), Z-test for population proportion, Z-test for difference between two means, Z-test for difference between two proportions, Applications in business and economics.		15
Unit III- Exact Sampling Distributions and Applications – I (t and F tests)	t-distribution: One sample and two sample t-tests (independent and paired), F-distribution: Test for equality of variances, Practical applications of t and F tests.		15
Unit IV- Exact Sampling Distributions and Applications – II (χ^2 tests)	Chi-square (χ^2) distribution: Test for goodness of fit, Test for independence of attributes, Applications of χ^2 distribution in research and business decision making		15

Suggested Readings:

1. Fundamentals of Statistics- S. C. Gupta.
2. Business Statistics - Bharat Jhunjhunwala
3. Statistical Methods- S. P. Gupta,
4. Introduction to Statistics- C. B. Gupta.
5. Essential Statistics- A. B. Rao.
6. Statistics for all (Volume I) – S. M. Aherkar
7. Statistics: Theory, Methods and Applications- Sancheti,D.C. &Kapoor V.K
8. Business Statistics: An Applied Orientation- P.K. Viswanathan
9. Statistics and their applications to Commerce - Borddigion
10. Business Statistics- Reddy, C.R Deep Publications, New Delhi.
11. Statistics Problems and Solutions- Kapoor V.K.
12. Fundamentals of Statistics - Elhance.D.N
13. Statistics - Gupta B.N.
14. Practical Business Statistics - Croxton & Crowdory.
15. Statistics Concepts & Applications- Nabendu Pal & Sahadeb Sarkar
16. Business Statistics- J.K.Sharma
17. Business Statistics - R.S.Bharadwa

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)		
VERTICAL: MAJOR MANDATORY PAPER - XI COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER -XI			
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks
4 Credits	4 Hours	60 Hours	100
Course Objectives: 1. To introduce the concepts of Game Theory and Decision Theory for business decision-making. 2. To develop skills in applying Network Analysis techniques (CPM and PERT) for project management. 3. To understand and use simulation methods, including Monte Carlo techniques, in business scenarios. 4. To enhance analytical and problem-solving skills for quantitative decision-making in commerce and industry.			
Unit	Contents		Lectures
Unit I- Game Theory	Meaning and definition of Game Theory, Types of games: Zero-sum and Non-zero-sum games, Pay-off matrix, Two-Person Zero-Sum Games, Maximin and Minimax principles, Saddle point and its identification, Mixed strategies, Rule of dominance for reducing strategies, Solution of 2×2 games by shortcut method, Solution of 2×2 games by graphical method, Applications in business and economics Examples and problem-solving exercises		15
Unit II- Decision Theory	Meaning and definition of Decision Theory, Decision-making under certainty, risk, and uncertainty, Decision criteria – Maximax, Maximin, Minimax Regret, Expected Monetary Value (EMV), Applications in business and economics.		15
Unit III- Network Analysis	Introduction to Network Analysis, Basic concepts – Nodes, Arcs, Network diagram, Critical Path Method (CPM), Project Evaluation and Review Technique (PERT), Float, Slack, Applications in project management and business. Numerical Examples		15
Unit IV- Simulation	Meaning and definition of Simulation, Steps in simulation process, Monte Carlo simulation, Random number generation, Applications of simulation in business and industry, Limitations		15

Suggested Readings:

1. Fundamentals of Applied Statistics by Gupta & Kapoor.
2. Operations Research by S.D. Sharma
3. Quantitative Techniques in Decision Making by J.K. Sharma
4. Operations Research by R.K. Gupta.
5. Statistical Methods by J. Medhi
6. Fundamentals Mathematical Statistics by Gupta & Kapoor.
7. Introduction to Mathematical Statistics by D. N. Elance.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)			
VERTICAL: MAJOR MANDATORY PAPER-XII COURSE CODE: COURSE NAME: BUSINESS STATISTICS PAPER -XII				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
02 Credits	02 Hours	30 Hours	50 (UA 30 + CA 20)	

Course Objectives:

- 1) To introduce the basic concepts of demography and sources of demographic data.
- 2) To develop understanding of census, registration systems, and survey methods.
- 3) To enable calculation and interpretation of mortality and fertility measures.
- 4) To apply demographic data in planning, policy making, and socio-economic analysis.

Unit	Contents	Lectures
Unit-I Demography -I	Introduction to Demography, Sources of demographic data, Census, Registration system, Ad-hoc surveys, Hospital records, Demographic profiles of Indian Census, Applications of demographic data in planning and policy making, Examples	15
Unit-II Demography -II	Introduction, Measures of Mortality (CDR, SDR, STDR by Direct Method, IMR), Measures of fertility (CBR, GFR, SFR, TFR) Reproduction rates: GRR & NRR. Crude rate of natural increase and Pearle's vital index. Assumptions, description and construction of Life tables. Examples.	15

Suggested Readings:

1. Fundamentals of Statistics- S. C. Gupta.
2. Business Statistics - Bharat Jhunjhunwala
3. Statistical Methods- S. P. Gupta,
4. Introduction to Statistics- C. B. Gupta.
5. Essential Statistics- A. B. Rao.
6. Statistics for all (Volume I) – S. M. Aherkar
7. Statistics: Theory, Methods and Applications- Sancheti,D.C. &Kapoor V.K
8. Business Statistics: An Applied Orientation- P.K. Viswanathan
9. Statistics and their applications to Commerce - Borddigion
10. Business Statistics- Reddy, C.R Deep Publications, New Delhi.
11. Statistics Problems and Solutions- Kapoor V.K.
12. Fundamentals of Statistics - Elhance.D.N
13. Statistics - Gupta B.N.
14. Practical Business Statistics - Croxton & Crowdory.
15. Statistics Concepts & Applications- Nabendu Pal & Sahadeb Sarkar
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 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संयन्ता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)			
VERTICAL: MINOR COURSE CODE: COURSE NAME: FUNDAMENTAL OF STATISTICS - II				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.	Total marks	
4 Credits	4 Hours	60 Hours	100 (UA 60 + CA 40)	

Course Objectives:

1. To introduce the concepts of hypothesis testing and its applications in statistical analysis.
2. To develop skills in applying large sample tests (Z-tests) for decision-making.
3. To understand and apply non-parametric tests for data that do not follow normal distribution.
4. To enhance analytical and problem-solving skills in research and business statistics.

Unit	Contents	Lectures
Unit I- Testing of Hypothesis	Meaning and definition of hypothesis, Null and Alternative Hypothesis, Steps in hypothesis testing, Types of errors (Type I & Type II), Level of significance, One-tailed and two-tailed tests, Uses and limitations of hypothesis testing.	15
Unit II- Large Sample Tests	Z-test for population mean (known variance), Z-test for population proportion, Z-test for difference between two means, Z-test for difference between two proportions, Applications in business and economics.	15
Unit II- Non-parametric Tests-I	Introduction to non-parametric tests, Advantages and limitations, Sign test, Wilcoxon Signed-Rank Test, Run test (Test for randomness), Applications with Examples	15
Unit II- Non-parametric Tests-II	Mann-Whitney U Test, Median Test, Chi-Square Test for goodness-of-fit and independence, Examples and Applications in Research Problems.	15

Suggested Readings:

1. Fundamentals of Statistics- S. C. Gupta.
2. Business Statistics - Bharat Jhunjhunwala
3. Statistical Methods- S. P. Gupta,
4. Introduction to Statistics- C. B. Gupta.
5. Essential Statistics- A. B. Rao.
6. Statistics for all (Volume I) – S. M. Aherkar
7. Statistics: Theory, Methods and Applications- Sancheti,D.C. &Kapoor V.K
8. Business Statistics: An Applied Orientation- P.K. Viswanathan
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 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 (B++ Grade (CGPA-2.96))	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)			
VERTICAL: Discipline Specific Elective 2 (A) COURSE CODE: COURSE NAME: Inventory Analysis				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.		Total marks
4 Credits	4 Hours	60 Hours		100
Course Objectives: 1. To develop understanding of inventory models such as EOQ and related cost concepts. 2. To enable students to analyse inventory problems under certainty and uncertainty. 3. To apply inventory control techniques like ABC analysis and JIT in real-life situations. 4. To enhance decision-making skills in inventory planning and control.				
Unit	Contents			Lectures
Unit I- Introduction to Inventory Analysis	Meaning and definition of inventory, Importance and objectives of inventory control, Types of inventories (raw materials, work-in-progress, finished goods), Inventory costs – ordering cost, carrying cost, shortage cost, Basic concepts and assumptions in inventory models			15
Unit II- Deterministic Inventory Models	Economic Order Quantity (EOQ) model, EOQ with shortages, EOQ with quantity discounts, Reorder level, Safety stock, Lead time, Numerical examples and applications			15

Unit III Probabilistic Inventory Models	Inventory models under uncertainty, Demand variability, Safety stock determination, Service level concept, Probabilistic EOQ model, Applications in business situations	15
Unit IV Advanced Inventory Control Techniques	Selective inventory control – ABC analysis, VED analysis, Just-in-Time (JIT) technique, Inventory control in practice, Applications and limitations of inventory models	15

Suggested Readings:

1. **Operations Research** – H.A. Taha
2. **Operations Research** – S.D. Sharma
3. **Quantitative Techniques in Management** – N.D. Vohra
4. **Introduction to Operations Research** – Frederick S. Hillier & Gerald J. Lieberman
5. **Business Statistics** – J.K. Sharma
6. **Operations Research: Principles and Applications** – Kanti Swarup, P.K. Gupta & Man Mohan
7. **Quantitative Methods for Business** – David R. Anderson, Dennis J. Sweeney & Thomas A. Williams

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 (B++ Grade (CGPA-2.36))	PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR PROGRAMME: B.COM. (BUSINESS STATISTICS) B.COM. - III SEMESTER – VI (NEP 2020)			
VERTICAL: Discipline Specific Elective 2 (B) COURSE CODE: COURSE NAME: Data Mining				
Course Credits	No. of Hrs. per Week	Total No. of Teaching Hrs.		Total marks
4 Credits	4 Hours	60 Hours		100
Course Objectives: 1. To introduce the concepts, scope, and importance of Data Mining in commerce and business. 2. To develop understanding of data preprocessing, classification, clustering, and association rule mining techniques. 3. To familiarize students with data warehousing and OLAP operations for business decision-making. 4. To expose students to advanced applications such as text mining, web mining, and Big Data analytics.				
Unit	Contents			Lectures
Unit I- Introduction to Data Mining	Meaning and definition of Data Mining, Importance and scope, Applications in commerce and business, Types of data (structured, unstructured, semi-structured), Data Mining process, Data preprocessing – cleaning, integration, transformation, reduction, Handling missing values.			15
Unit II- Data Warehousing and OLAP	Data Warehouse: definition, architecture, components, metadata, OLAP operations – roll-up, drill-down, slice and dice, types of OLAP (MOLAP, ROLAP, HOLAP), Data marts, Applications in business decision-making.			15
Unit III Data Mining Techniques	Classification: Decision Trees, Naïve Bayes, k-NN, Regression analysis; Clustering: K-Means, Hierarchical clustering; Association Rule Mining: Apriori algorithm, Support and Confidence, Examples and applications in business.			15
Unit IV Advanced Topics and Applications	Text mining, Web mining, Big Data analytics overview, Data mining tools (WEKA, R, Python libraries), Applications in marketing, finance, e-commerce, fraud detection, Case studies and examples			15

Suggested Readings:

1. Data Mining: Concepts and Techniques – Jiawei Han, Micheline Kamber & Jian Pei
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach & Vipin Kumar
3. Data Mining Techniques – Michael Berry & Gordon Linoff
4. Practical Data Mining for Business – Graham Williams
5. Data Mining: The Textbook – Charu C. Aggarwal
6. Business Intelligence and Data Mining – Alex Berson & Stephen J. Smith
7. Fundamentals of Data Mining in Business – Galit Shmueli, Nitin R. Patel & Peter C. Bruce