Department of Statistics
B.N. College (A), Dhubri

Syllabus for four year degree course

(Semester 1 and semester 2)

This syllabus was approved by the board of studies, the meeting of which was held on 19.12.2024
Name of the Department: STATISTICS

Semester: 1
Paper Type: Core
Paper Code: STA-DSC-141
Name of the Paper: Descriptive Statistics

Credit: 4 [Theory (3) + Practical/Lab (1)] **Hours:75**
Lecture: 45 **Practical: 30** **Tutorial: 00**

Full Marks: 100

Course Outcome: After completion of the course the students will be able to:
CO1: understand, remember and apply the basic concepts of statistics and list down the pros and cons of it.
CO2: Analyze, evaluate, create, visualise and describe statistical data types, their classification and their diagrammatic presentation.
CO3: remember, understand and apply the measures of central tendency, measures of dispersion, coefficient of variation and moments.
CO4: understand and remember the basic concepts of bivariate data analysis, correlation coefficient, correlation ratio and simple linear regression.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Introduction to Statistics	Definition, scope and limitations of Statistics. (Assignments only)	03	05
2	Statistical data	Concepts of population and sample. Data: raw and arranged, primary and secondary data, quantitative and qualitative data, cross-sectional, time-series and spatial data and their methods of collection. Variables: discrete and continuous. Scale of measurement: nominal, ordinal, ratio and interval. Presentation of raw data and arranged data, tabular, diagrammatic and graphical representation (bar, pie, histogram, line, box plot, and stem & leaf)	06	10
3	Descriptive Statistics	Measures of central tendency with raw and arranged data: arithmetic mean, geometric mean, harmonic mean, median and mode. Partition values: quartiles, deciles and percentiles. Measures of dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation. Moments: raw and central moments (their interrelationship), absolute and factorial moments, and Sheppard's correction for moments, skewness and kurtosis.	24	40

4	Bivariate data analysis	Definition and representation of bivariate data (Discrete, Continuous and mixed data), scatter diagram, Karl Pearson's correlation coefficient, rank correlation, correlation ratio and intra-class correlation (basic concept). Method of least square, fitting of 1^{st} and 2^{nd} degree polynomial and exponential curves. Simple linear regression.	12	20
5	Practical	Practical (only from units 2, 3 and 4) • Preparation of frequency distribution table. • Representation of data through graphs (bar, pie, histogram, line) • Box & whisker plot and stem & leaf plot to represent data • Problems based on measures of central tendency (mean, median, mode) • Problems based on measures of dispersion (variance, quartile deviation, inter-quartile range, mean deviation) • To find coefficient of variation • Problems based on moments, skewness and kurtosis • Problem based on correlation (simple, rank and multiple correlation) • Problem based on simple linear regression	30	25

Reference Books:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I, 8thEdn. The World Press, Kolkata.
2. Gupta S.C. and Kapoor V.K.(2002): Fundamental of Mathematical Statistics, 11th Edition. Sultan Chand and Sons, New Delhi.
3. Agarwal, B. (2007c). Programmed Statistics (Question-Answers). New Age International.
4. Medhi, J., Statistical Methods: An Introductory text (New Age International (P) Ltd. 2000)
5. Yule, G. U. (1911). An Introduction to the Theory of Statistics. Journal of the Royal Statistical Society, 101(1), 225.

Name of the Department: STATISTICS
Semester: 1
Paper Type: Skill Enhancement Course
Paper Code: STA-SEC-131
Name of the Paper: Statistical Analysis Using MS-Excel

Credit: 3 [Theory (2) + Practical/Lab (1)] **Hours:60**
Lecture:30 **Practical: 30** **Tutorial: 00**

Full Marks: 75

Course Outcome: After completion of the course the students will be able to:
CO1: understand, apply and presentation of raw data and arranged data in tabular as well as diagrammatic mode.
CO2: remember and understand the concept of measures of central tendency, partition values and measures of dispersion.
CO3: apply MS-Excel to present the theoretical knowledge taught in the previous units.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Presentation of data	Data: grouped and ungrouped and their representation, tabular, diagrammatic and graphical representation (bar, pie, histogram, line, box and plot) of data	09	15
2	Descriptive Statistics	Measures of central tendency with raw and arranged data: arithmetic mean, median and mode.Partition values: quartiles, deciles and percentiles. Measures of dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, relative measures of dispersion, skewness and kurtosis,Karl Pearsons's correlation coefficient and simple linear regression	15	25
3	MS-Excel	Basics concept of MS-Excel. Application of MS-Excel on unit 1 and unit 2	06	10
4	Practical	Practical using MS-Excel (only from unit 3) • Preparation of frequency distribution table. • Representation of data through graphs (bar, pie, histogram, line) • Problems based on measures of central tendency (mean, median, mode) • Problems based on measures of dispersion (variance,	30	25

		quartile deviation, inter-quartile range, mean deviation) • To find coefficient of variation • To find correlation coefficient • To find regression coefficients		

Reference Books:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& Vol. II 8 thEdn. The World Press, Kolkata.
2. McFedries, P. (2022). Excel Data Analysis For Dummies. John Wiley & Sons.
3. Winston, W. L. (2014). Marketing Analytics: Data-Driven Techniques with Microsoft Excel. John Wiley & Sons.
4. Triola, M. F. (2017). Elementary statistics using Excel (6^{th}ed.). Pearson.
5. Siegel, A. F., & Shim, J. K. (2017). Schaum's outline of statistics for business and economics: Including Microsoft Excel. McGraw-Hill Education.
6. Levine, D. M., Stephan, D. F., & Krehbiel, T. C. (2018). Statistics for managers using Microsoft Excel (8th ed.). Pearson.

Name of the Department: STATISTICS
Semester: 1
Paper Type: Multidisciplinary Course (MDC)
Paper Code: STA-MDC-131
Name of the Paper: Basic Statistics

Credit: 3 [Theory (3) + Practical/Lab (0)] **Hours:45**
Lecture: 45 **Practical: 00** **Tutorial: 00**

Full Marks: 75

Course Outcome: After completion of the course the students will be able to:
CO1: understand and remember the basic concepts of statistics and list down the pros and cons of it.
CO2: understand, apply and analyze statistical data types, their classification and their diagrammatic presentation.
CO3: remember, understand and apply the measures of central tendency, partition values and measures of dispersion.
CO4: understand, analyze and evaluate the fundamental knowledge correlation and regression.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Introduction to Statistics	Definition, scope and limitations of Statistics. (Assignments only)	06	10
2	Statistical data	Concepts of population and sample. Data: primary and secondary data, quantitative and qualitative data, cross-sectional, time-series and spatial data and their methods of collection. Variables: continuous and discrete. Scale of measurement: nominal, ordinal. Presentation of data: frequency and non frequency presentation, tabular , diagrammatic and graphical representation (bar, pie, histogram, line, box and whisker plot)	15	25
3	Descriptive Statistics	Measures of central tendency with raw and arranged data: arithmetic mean, median and mode. Partition values: quartiles, deciles and percentiles. Measures of dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation.	15	25
4	Correlation and Regression	Method of least squares. Simple Correlation coefficient (Karl Pearson). Simple linear regression	09	15

Reference Books:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I, 8thEdn. The World Press, Kolkata.
2. Gupta S.C. and Kapoor V.K.(2002): Fundamental of Mathematical Statistics, 11th Edition. Sultan Chand and Sons, New Delhi.
3. Medhi, J. (2006). Statistical Methods: An Introductory Text. New age international publishers.

Name of the Department: STATISTICS
Semester: 2
Paper Type: Core
Paper Code: STA-DSC-142
Name of the Paper: Statistical Methods

Credit: 4 [Theory (3) + Practical/Lab (1)] **Hours:75**
Lecture: 45 **Practical: 30** **Tutorial: 00**

Full Marks: 100

Course Outcome: After completion of the course the students will be able to:
CO1: understand, apply and evaluate the knowledge of probability theory.
CO2: understand, apply and express the knowledge of finite differences and numerical analysis.
CO3: understand and apply generating functions and mathematical expectations.
CO4: remember and understand the knowledge of few basic distributions.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Probability and random variables	Concept of random experiment, sample space, trial and events (simple and composite), mutually exclusive events, equally likely events, favourable cases, exhaustive cases. Definition of probability: classical, statistical and axiomatic. Theorems of addition, Conditional probability and multiplication theorem, independent and dependent events, Bayes' theorem. Random variables, Discrete and continuous random variables, probability mass function (pmf), probability density function (pdf), cumulative distribution function (cdf) and their properties.	09	15
2	Finite differences	Definition, operators Δ and E and their properties, difference table, estimation of missing terms.Interpolation: Newton's forward and backward interpolation formula, Lagrange's interpolation formula and Gauss's interpolation formula. Divided differences: difference table, Newton's divided difference formula.Numerical integration: introduction, general quadrature formula, trapezoidal rule, Simpson's (1/3) and (3/8) rule, Weddle's rule.	12	20

3	Generating functions and mathematical expectations	Moment generating function, characteristic function, cumulant generating function, probability generating function, uniqueness and inversion theorem (without proof) and properties. Mathematical expectation of single and bivariate random variables and its properties. Variance and covariance. Conditional expectation and conditional variance	12	20
4	Basic probability distributions	Normal, Uniform, Binomial and Poisson distribution and their properties	12	20
5	Practical	Practical (only from units 1,2 & 4) • Problem based on Newton's (forward &backward) interpolation formula, Lagrange's interpolation formula and Gauss's interpolation formula. • Problem based on trapezoidal rule, Simpson's (1/3) and (3/8) rule, Weddle's rule. • Fitting of normal distribution. • Fitting of Binomial distribution. • Fitting of Poisson distribution. • Problem based on area property of normal distribution	30	25

Reference Books:

1. Gupta P.P, Malik G.S. and Gupta S.,(2006), Calculus of Finite Differences and Numerical Analysis, 34thEdn, Krishna Prakashan Media (P) Ltd,Meerut.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I, 8th Edn. The World Press, Kolkata.
3. Gupta S.C. and Kapoor V.K.(2002): Fundamental of Mathematical Statistics, 11th Edition. Sultan Chand and Sons, New Delhi.
4. Yule, G. U. (1911). An Introduction to the Theory of Statistics. Journal of the Royal Statistical Society
5. Medhi, J. (2006). Statistical Methods: An Introductory Text. New age international publishers
6. Agarwal, B. (2007c). Programmed Statistics (Question-Answers). New Age International. 7. Yule, G. U. (1911). An Introduction to the Theory of Statistics. Journal of the Royal statistical society

Name of the Department: STATISTICS
Semester: 2
Paper Type: Skill Enhancement Course
Paper Code: STA-SEC-132
Name of the Paper: Statistical Analysis Using R Programming

Credit: 3 [Theory (2) + Practical/Lab (1)] **Hours:60**
Lecture: 30 **Practical: 30** **Tutorial: 00**

Full Marks: 75

Course Outcome: After completion of the course the students will be able to:
CO1: remember and understand how to install and use basics of R programming language.
CO2: understand, apply, analyze and presentation of raw data and arranged data in tabular as well as diagrammatic mode using R.
CO3: understand, remember and apply the concept of measures of central tendency, partition values and measures of dispersion and use R to present it.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Basics concept of R programming	Introduction to R, Installation of R and R studio. Data entry methods, import and export of data.	06	10
2	Presentation of data using R programming	Data: grouped & ungrouped and their representation, tabular, diagrammatic and graphical representation (bar, pie, histogram, line, box and plot) of data using R programming.	12	20
3	Descriptive Statistics using R programming	Measures of central tendency with raw and arranged data: arithmetic mean, median and mode.Partition values: quartiles, deciles and percentiles. Measures of dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, relative measures of dispersion, skewness and kurtosis, Karl Pearsons's correlation coefficient and simple linear regression	12	20
4	Practical	Practical • Preparation of frequency distribution table. • Representation of data through graphs (bar, pie, histogram, line)	30	25

		• Box plot plot to represent data • Problems based on measures of central tendency (mean, median, mode) • Problems based on measures of dispersion (variance, quartile deviation, inter-quartile range, mean deviation) • To find coefficient of variation • To find correlation coefficient • To find regression coefficients		

Reference Books:

1. Dalgaard, P. (2002). Introductory statistics with R (2nd ed.). Springer.
2. Fox, J. (2002). An R and S-Plus companion to applied regression. Sage Publications Inc.
3. Crawley, M. J. (2005). Statistics: An introduction using R. Wiley.
4. Wickham, H., & Grolemund, G. (2017). R for data science: Import, tidy, transform, visualize, and model data. O'Reilly Media, Inc.
5. Kuhn, M. (2019). Feature engineering and selection: A practical approach for predictive models. Chapman and Hall/CRC.
6. James, G., Witten, D., Hastie, T., &Tibshirani, R. (2013). An introduction to statistical learning: With applications in R. Springer

Name of the Department: STATISTICS
Semester: 2
Paper Type: Multidisciplinary Course (MDC)
Paper Code: STA-MDC-132
Name of the Paper: Applied Statistics

Credit: 3 [Theory (3) + Practical/Lab (0)] **Hours:45**
Lecture: 45 **Practical: 00** **Tutorial: 00**

Full Marks: 75

Course Outcome: After completion of the course the students will be able to:
CO1: understand and remember the concepts of index numbers.
CO2: understand and apply time series analysis.
CO3: remember and understand the basic idea of sample survey.

Main Syllabus:

Unit No.	Unit name	Syllabus	Class Hour	Allotted Marks
1	Index numbers	Definition, construction of index numbers, weighted and unweighted index numbers. Laspeyre's, Paasche's, Fisher's, Marshall-Edgeworth index numbers, cost of living index numbers, their uses and limitations	15	25
2	Time series analysis	Introduction, components of time series, additive and multiplicative model of time series. Measurement of trend using free hand curve, method of semi averages and moving average	15	25
3	Sample survey	Description of population and sample, complete enumeration versus sample survey. Sampling frame, sampling and non-sampling error, steps involved in sample survey, idea of pilot survey. Probability sampling (basics of simple random sampling with and without replacement) and non-probability sampling (judgment sampling)	15	25

Reference Books:

1. Gupta, S. P., & Kapoor, V. K. (2017). Fundamentals of applied statistics (5th ed.). Sultan Chand & Sons.

2. Goon, S.C., Gupta, M.K., & Dasgupta, B. (2019). Fundamentals of Statistics, Volume 2. World Scientific Publishing.
3. Mukhopadhyay, P. (2014). Applied Statistics. Boca Raton: CRC Press.
4. Karmakar, S. (2013). Index numbers: A guide to practice. New Delhi: PHI Learning Private Limited.
5. Sengupta, S., & Mondal, S. (2018). Official statistics: An introduction. New Delhi: Sage Publications India Pvt Ltd.
6. Cochran, W.G. (1984): Sampling Techniques (3rd Ed.), Wiley Eastern.
7. Sukhatme, P.V., Sukhatme, B.V. Sukhatme, S. Asok,C.(1984). Sampling Theories of Survey With Application, IOWA State University Press and Indian Society of Agricultural Statistics