



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

M.Sc. (Zoology) Programme

Subject Code& Name: - MS02EZOO02 – Biostatistics

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				Internal		External	
L	T	P	Total	TH	PWE	TH	PWE
2	--	2	4	25%	25%	25%	25%

Programme Name	M.Sc. Zoology
Semester	II
Course Code	MS02EZOO02
Course Title	Biostatistics
Course Content Type (Th./Pr.)	Theory + Practical
Course Credit	4
Sessions+ Lab. Per Week	2 + 2
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Upon completion of the course, students will be able to:

- Understand fundamental statistical concepts and their applications in biological sciences.
- Apply appropriate statistical methods for analyzing biological and ecological data.
- Interpret statistical results and communicate scientific findings effectively.

Prerequisites (if any)

- Basic knowledge of Mathematics at undergraduate level.
- Understanding of biological research methods and experimental design.
- Familiarity with spreadsheet software (MS Excel/LibreOffice Calc).

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Explain statistical concepts, probability distributions and experimental designs used in biological research. Analyze biological datasets using descriptive and inferential statistical methods.
- Apply statistical software tools for data analysis, interpretation and presentation of research results.



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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Introduction to Biostatistics and Data Analysis • Scope and importance of Biostatistics in Biology • Types of biological data • Data collection and sampling methods • Classification and tabulation of data Graphical representation: • Histogram, Frequency polygon, Bar diagram, Pie chart, Box plot Measures of central tendency: Mean, Median and Mode Measures of dispersion: Range, Variance, Standard deviation • Coefficient of variation Probability and Distributions • Basic concepts of probability • Addition and multiplication rules • Conditional probability and Random variables Probability distributions: • Binomial distribution, Poisson distribution and Normal distribution • Standard normal curve • Biological applications of probability distributions	15
II	Statistical Inference and Hypothesis Testing • Sampling distribution • Estimation and confidence intervals • Null and alternative hypotheses • Type I and Type II errors • Parametric tests: Z-test, t-test, Paired t-test and Chi-square test • Analysis of Variance (One-way ANOVA) Correlation, Regression and Experimental Design • Correlation analysis: Pearson's correlation and Spearman's rank correlation • Linear regression • Multiple regression (Introduction) • Data interpretation and reporting • Introduction to statistical software: MS Excel and PAST	15



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Practical(s) (if any)	
List of Practical (Practical are demonstrated using charts, models and multimedia videos) 1. Preparation and organization of biological datasets. 2. Construction of frequency tables. 3. Graphical representation of biological data using histograms, bar diagrams, pie charts, and box plots. 4. Calculation of mean, median, mode, variance, standard deviation, and coefficient of variation. 5. Calculation of standard error and confidence intervals. 6. Applications of Binomial, Poisson, and Normal distributions. 7. Standard normal probability calculations. 8. Application of Z-test and Student's t-test. 9. Paired and unpaired t-tests using biological datasets. 10. Chi-square test for goodness of fit and contingency tables. 11. One-way ANOVA using ecological or biological data. 12. Calculation and interpretation of Pearson's correlation coefficient. 13. Linear regression and prediction. 14. Data analysis using MS Excel. 15. Analysis using PAST statistical package. 16. Preparation of publication-quality graphs and tables.	30 hours

Text Books
1. Biostatistics: A Foundation for Analysis in the Health Sciences by Wayne W. Daniel & Chad L. Cross; Wiley India Pvt. Ltd. 2. Fundamentals of Biostatistics by Bernard Rosner; Cengage Learning India. 3. Biostatistics and Research Methodology by P. Ramakrishnan; Saras Publications, Nagercoil. 4. Basic Statistics by B.L. Agarwal; New Age International Publishers, New Delhi. 5. Biostatistics by R. Arumugam & P. Thangapandi Isaac; New Gamma Publishing House. 6. Statistical Methods by S.P. Gupta; Sultan Chand & Sons, New Delhi. 7. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor; Sultan Chand & Sons, New Delhi.



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Reference Books

1. Statistical Methods for Agricultural Workers by V.G. Panse & P.V. Sukhatme, ICAR Publications, New Delhi.
2. Research Methodology: Methods and Techniques by C.R. Kothari & Gaurav Garg, New Age International Publishers.
3. Biostatistics in Theory and Practice by T.K. Saha, Emkay Publications.
4. An Introduction to Biostatistics by P.S.S. Sundar Rao & J. Richard, Prentice Hall India.
5. Practical Statistics for Medical Research by Douglas G. Altman, Chapman & Hall/CRC.
6. Biostatistical Analysis by Jerrold H. Zar, Pearson Education.
7. Statistics for Biologists by Campbell & Machin, Cambridge University Press.
8. Biometry by Robert R. Sokal & F. James Rohlf, W.H. Freeman and Company.
9. The Analysis of Biological Data by Michael C. Whitlock & Dolph Schluter, Roberts and Company Publishers.
10. Statistics for Experimenters by George E.P. Box, William G. Hunter & J. Stuart Hunter, Wiley.
11. Introduction to the Practice of Statistics by David S. Moore, George P. McCabe & Bruce Craig, W.H. Freeman.
12. Discovering Statistics Using R by Andy Field, Jeremy Miles & Zoë Field, Sage Publications.

Web Resources

- Indian Council of Agricultural Research (ICAR): <https://icar.gov.in>
- National Statistical Office (NSO): <https://mospi.gov.in>
- e-PG Pathshala Statistics Modules: <https://epgp.inflibnet.ac.in>
- SWAYAM: <https://swayam.gov.in>
- NPTEL Statistics Courses: <https://nptel.ac.in>
- National Digital Library of India (NDLI): <https://ndl.iitkgp.ac.in>

Required Software(s) (if any)

Microsoft Excel

PAST Statistics: <https://www.nhm.uio.no/english/research/resources/past>

L:: Lecture, **T::** Tutorial, **P::** Practical

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

