Semester IV
Name of the Programme: M. Sc. Zoology
Course Code: ZOO-614 **Course Title: Research Methodology**
Number of Credits: 4
Effective from AY: 2023 -24

Prerequisite for the Course:	Basic knowledge of biology and mathematics	
Objectives:	1. To explain the need for research methodology in conducting scientific research 2. To demonstrate the use of various statistical analyses 3. To visualize and interpret data in a scientific manner 4. To communicate the data in the form of reports / research articles	
Content:	**Module 1: Introduction to research methodology** Research and Scientific Method, Types of Research, Significance of Research, Selecting a Research Problem, Research Design, Criteria of Good Research, defining and delimiting Research problem, Formulation of Hypothesis, Characteristics of good Hypothesis, Procedure for Hypothesis Testing, Null hypothesis, Literature review, research methods: Scientific method vs Arbitrary Method, Logical Scientific Methods: Deductive, Inductive, Deductive-Inductive, pattern of Deductive – Inductive logical process – Different types of inductive logical methods, Research fellowships and schemes available for post graduate students for higher education (importance of CSIR NET JRF life science and environmental science/ GATE/ ICMR/ DBT etc). **Module 2** Sources of data: primary, secondary and tertiary, Types of data: Nominal and ordinal, Data collection: observation, field investigations, experimental observations, Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, types of sampling designs: Non-probability sampling, Probability sampling; Primary data, Secondary data, tools and methods of data collection, Sampling Distribution, data compilation, tools in data analysis, Biases in data collection, Descriptive	15 hours 15 hours

	Analysis – Inferential Analysis- Correlation analysis **Module 3: Statistical analyses** Descriptive statistics: Measurement Scales, Sources of error in measurement. Measures of central Tendency (Mean, medium, Mode), Measures of dispersion (range, mean deviation, standard deviation) Inferential statistics: Normal Probability Curve- Meaning, characteristics and applications. Standard error, Confidence Intervals, Type I and Type II errors, Pearson's Correlations, Significance of correlation, Concept of Variance, Analysis of Variance (ANOVA), Regression, Testing the Significance of difference between means (z and 't' test), Non-Parametric Statistics: Sign Test, Mann- Whitney U Test, Kruskall-Wallis test, Characteristics and applications, Statistical software (MS-Excel, SPSS, R studio) **Module 4: Scientific writing** Importance of effective communication, Interpretation of results; Graphical representation of Data, Processing of data, Types of Reports, Oral Presentation, Layout of a Research Paper, Writing Format and style, Literature review, Major findings, Discussion, Conclusions and suggestions, Citation and styles of references and Bibliography, Reference Management Software, Authorship responsibilities, Ethics in writing and publishing, Scientific misconduct: Plagiarism, fabrication and falsification in research, Salami slicing, Duplication of publications; Journal publication processes, Predatory vs reputed journals, Indexed journals: Web of Science, PubMed, Scopus; Journal Metrics.	15 hours 15 hours
Pedagogy	Discussions, tutorials, self-study, video lectures and presentations	
Reading / Reference	1. C.R. Kothari, Research Methodology: Methods and Techniques, 2nd ed. New Delhi: New Age International Publishers, 2004. 2. T. Greenfield, and S. Greener, Research Methods for Postgraduates, 3rd ed. John Wiley & Sons, Ltd., 2016 3. N. Gurumani, Research Methodology for Biological	

	Sciences, New Delhi: MJP Publishers, 2008. 4. D.M. Hawkins, Biomeasurement: a student's guide to biological statistics, New York: Oxford University Press, 2009.	
Outcomes	The learner will 1. Perform research work in a scientific and organized manner and produce accurate results 2. Analyze datasets of their research efficiently 3. Interpret the results of statistical analyses 4. Effectively communicate the results in a report / research paper	

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