Department of Botany

MBL 386 2.0 Biostatistics and Computer Applications

Duration: 30 lecture hours

Pre-requisites: None

Lecturer in charge: Ms. Thiyanga Talagala

Department of Statistics and Computer Science

Course contents:

1 Introduction to Statistics

1.1 What is Statistics?

1.2 Data and Information

1.3 Distinguishing between Variables and Data

1.4 Descriptive Statistics and Inferential Statistics

1.5 Classification of Variables

1.5.1 Qualitative Variables

1.5.2 Quantitative Variables

1.5.3 Discrete Variables

1.5.4 Continuous Variables

1.5.5 Scales of measurement

1.5.5.1 Nominal Variables

1.5.5.2 Ordinal Variables

1.5.5.3 Interval Variables

1.5.5.4 Ratio Variables

2 Data Collection

2.1 Steps in Data Collection

2.2 Primary and secondary data

2.3 Observational studies and Experimental studies

2.4 Sampling Methods

2.4.1 Probability Sampling
2.4.1.1 Simple random sampling
2.4.1.2 Stratified random sampling
2.4.1.3 Systematic sampling
2.4.1.4 Cluster sampling
2.4.2 Non-Probability Sampling
2.4.2.1 Convenience sampling
2.4.2.2 Quota sampling

3 Descriptive Statistics
3.1 Organizing Qualitative Data
3.1.1 Graphical summaries
3.1.2 Tabular data summaries
3.2 Organizing Quantitative Data
3.2.1 The frequency distribution
3.2.2 Graphical summaries
3.3 Descriptive Statistics
3.3.1 Measures of Central Tendency
3.3.2 Measures of Dispersion
3.4 Measures of association/ correlation

4 Probability
4.1 Events
4.2 Event operations
4.3 Mutually exclusive events
4.4 Properties of probability
4.5 Calculation of probability
4.5.1 Classical method
4.5.2 Empirical method
4.6 Conditional probability
4.7 Independent events
4.8 Basic probability rules
4.8.1 Complement rule
4.8.2 Addition rule

4.8.3 Multiplication rule

4.8.4 Total probability law

4.8.5 Bayes' theorem

5 Probability Distributions

5.1 Introduction

5.2 Probability Distributions of Discrete Variables

5.2.1 The Binomial Distribution

5.2.2 The Poisson Distribution

5.3 Continuous Probability Distributions

5.3.1 The Normal Distribution

5.3.2 Normal Distribution Applications

5.4 Sampling Distributions

6. Introduction to Statistical Inference

6.1 Estimation

6.1.1 Point Estimation

6.1.2 Interval Estimation

6.2 Test of Hypotheses

6.2.1 Test of Hypotheses Based on a Single Sample

6.2.2 Inferences Based on Two Samples

6.2.3 The Analysis of Variance

7. Design of Experiments

8. Simple Linear Regression and Correlation

9. Data Analysis with MINITAB

Course Objectives:

1. To introduce basic concepts in Statistics.
2. To have the student become skilled in organizing and summarizing data.
3. To have the student become skilled in calculating simple theoretical probabilities.

4. Introduce concepts and techniques required to carry out an advanced statistical analysis by applying suitable techniques.
5. Introduce concepts and techniques required to write a statistical report based on findings of the statistical data analysis.

Learning Outcomes:

1. Identify the role of statistics in society.
2. Identify and describe the branches of statistics.
3. Identify the limitations of statistics.
4. Distinguish between Descriptive and Inferential Statistics, Observational and Experimental Studies, Primary and Secondary data, Random and Non-Random Sampling, Sampling and Non-Sampling Errors.
5. Interpret the key terms used in statistics such as Population, Sample, etc.
6. Design questionnaire
7. Explain different methods of sampling
8. Identify the most suitable sampling method for a given situation and apply it.
9. Compare advantages and disadvantages of different sampling methods.
10. Construct suitable tables and graphs to represent a given data set.
11. Analyze a given data set using suitable summary measures and interpret the results.
12. Calculate probability of events using probability rules, Interpret the probability.
13. Calculate probabilities related to distributions.
14. Analyze a given dataset by applying suitable advanced statistical techniques. (Both parametric and Non - parametric).
15. Use MINITAB effectively in data analysis operations.
16. Write a statistical report on finding of the statistical data analysis.

Method of Assessments:

1. Mid semester examination – 20%
2. Semester terminal examination – 80%

Recommended text book:

Biostatistics; A Foundation for Analysis in the Health Sciences

Author: Wayne W. Daniel Publisher: John Wiley & Sons, Inc.

Prepared by Thiyanga S. Talagala, Department of Statistics and Computer Science.