

Course Name: Biostatistics

Credit Hours: 2-1

Contact Hours: 2-3

Pre-requisites: None

Course Introduction:

The course is targeting the following objectives using a variety of computing tools/software/libraries like Minitab, Statistical Package for Social Sciences (SPSS), R, Python or any other.

1. To introduce students to the fundamental concepts of Statistics, including nature and types of variables, data collection, handling, visualization and analysis
2. To provide common knowledge of systematic dealing strategies regarding data for meaningful insight of the raw information in the field, while analyzing common problems of the society through hands on practice sessions.

Outcomes:

After successful completion of the course, students will be able to,

1. Know various computing tools/software of modern time
2. Understand and analyze data of quantitative & qualitative variables including collection, visualization, summarization and inferential
3. Comprehend hypothesis testing to make inferences about population characteristics
4. Perform regression analysis to model relationships between variables for predictions
5. Plan sampling strategies, and principles & protocols of survey
6. Understand the difference between parametric and non-parametric methods, classical and Bayesian approach of problem solving

Course Outline:

#	Weekly Distribution of Course Contents
Week-1	An introduction to Statistics: Role of statistics in bioinformatics and data analysis
Week-2	Data types, sources, visualization and descriptive analysis
Week-3	Correlation and Association
Week-4	Regression analysis
Week-5	Non-linear models, logistic regression, etc., Goodness of fit tests
Week-6	Survey Sampling: The role and need of sampling, Basic concepts and terminologies
Week-7	Probability and non-probability sampling, simple random sample, snowball sampling, etc.
Week-8	Mid-term Exam
Week-9	Statistical Inference: Estimation and testing of hypotheses related to mean, variance and proportion while dealing with one or two populations
Week-10	Continuation of Statistical Inference: Estimation and testing of hypotheses related to mean, variance and proportion while dealing with one or two populations
Week-11	Analysis of variance and design of experiments: One way or completely randomized design
Week-12	Analysis of variance and design of experiments: Two way analysis of variance or Randomized complete block design
Week-	Non-parametric methods

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Week-14	Bayesian statistics
Week-15	Continuation of Bayesian statistics/Recap
Week-16	Final-term exam

#	Weekly Distribution of Lab
Week-1	Introduction to statistical computing tools, collection/downloading of data.
Week-2	Data preprocessing, data visualization
Week-3	Computing descriptive statistics
Week-4	Performing correlation and association
Week-5	Performing regression analysis
Week-6	Collection of data using various sampling methods
Week-7	Continuation of collection of data using various sampling methods
Week-8	Mid-term Exam
Week-9	Performing hypothesis testing related to mean for one and two populations
Week-10	Performing hypothesis testing regarding variance/standard deviation of one and two populations
Week-11	Performing hypothesis testing regarding proportion of one and two populations
Week-12	Computing hypothesis testing of analysis of variance one way or completely randomized design
Week-13	Computing hypothesis testing of analysis of variance two way or randomized complete block design
Week-14	Applying non-parametric statistics
Week-15	Computing strategies of Bayesian statistics

Week-16	Final-term exam
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Reference Materials:

1. Introductory Statistics, 4th edition by Sheldon M. Ross. 2017. ISBN-13 978-0128043172. Publisher Academic Press
2. Applied Regression Analysis, 3rd edition by Norman R. Draper & Harry Smith. ISBN: 978-0-471-17082-2. Publisher WILEY
3. Introduction to Statistical Theory Part-I by Prof. Sher Muhammad Chaudhry & Dr. Shahid Kamal. Publisher Ilmi Kitab Khana
4. Introduction to Statistical Theory Part-II by Prof. Sher Muhammad Chaudhry & Dr. Shahid Kamal. Publisher Ilmi Kitab Khana