



**YENEPOYA**

(DEEMED TO BE UNIVERSITY)

Recognized under Sec 3(A) of the UGC Act 1956

Accredited by NAAC with 'A' Grade

# **YENEPOYA (DEEMED TO BE UNIVERSITY)**

**PROGRAM AND COURSE OUTCOMES**

**POSTGRADUATE PROGRAM**

**MASTER OF SCIENCE IN BIOSTATISTICS**

**ATTENDED**

**Dr. Gangadhara Somayaji K S**  
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Mangalore 575 018, Karnataka.

**PROGRAM OUTCOME**  
**POST GRADUATE PROGRAM**  
**M.SC. BIostatISTICS**

(K= Knowledge, S=Skill, A=Attitude)

- PO1. The goal of this program is to train students in statistical methods, as applied to the problems in the biomedical and health sciences (K, S).
- PO2. Identify appropriate probability distributions relating to the phenomenon under study (K).
- PO3. Exposed to broad base of practical techniques to work effectively in biomedical industry and academic settings (S, A)
- PO4. Proficiency in identifying the bio-medical research problem and find the solution through statistical approach (K, S).
- PO5. Effectively use bio-statistical methods in biomedical and health science problems for data collection, data management, designs, analysis and interpretation (S, A)
- PO6. To develop the quality human resource who are technically competent to use advance statistical methods to handle and analyze complex data environment (S).
- PO7. Acquire skills in data display, summary presentation and pattern recognition using statistical packages like SPSS, STATA and R (K, S).
- PO8. The theoretical foundations, design guidelines and computational skills associated with different fields of Biostatistics to pursue research in advanced areas of Biostatistics (K, S).
- PO9. Acquires skills in Statistical Consultancy to become freelance Biostatistician (A).

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**COURSE OUTCOMES**  
**POST GRADUATE PROGRAM**  
**M.Sc. Biostatistics**

**First Semester**

**MATHEMATICAL FOUNDATION**

- CO1. Necessary knowledge on theoretical foundation on Calculus and their applications in different branches of Biostatistics
- CO2. Necessary theoretical foundations on Matrix algebra and highlight their applications in different statistical computations.
- CO3. Concentrate on Statistical concepts in subsequent Courses and not be distracted by the mathematics involved in the study.
- CO4. Follow the mathematics used in Biostatistics at master's degree level
- CO5. Understand the mathematics behind statistical methods introduced at that level.
- CO6. Work out matrix computations, determine different characteristics of a matrix and demonstrate various decomposition of matrices and their application

**PROBABILITY AND PROBABILITY DISTRIBUTIONS**

- CO1. To provide necessary foundation in probability and probability distributions so as to apply it to the study of inferential problems studied under Biostatistics
- CO2. To understand few probability distributions that are of importance in Biostatistics.
- CO3. To provide statistical inference basis on mathematical computations and students will be able to use it to study the health science problem.
- CO3. Applications of the limit theorems in the medical problems and provide the solution by means of inferential approach.
- CO4. Identifying the probability distribution of various epidemiological disease spread which helps to study the disease behavior.

## STATISTICAL INFERENCE

- CO1. To familiarize concepts and terminology that forms the basis of inference
- CO2. To provide a basic foundation in the concepts and methods of statistical inference with a strong emphasis on practical aspects of the interpretation of statistically based conclusions in health science problems.
- CO3. Choose an appropriate estimation method and testing procedure in real life medical problems
- CO4. Apply hypothesis testing via some of the statistical distributions.
- CO5. Determine the sample size for various situations in biomedical and health science problems.

## NON-PARAMETRIC METHODS

- CO1. To know Basics of nonparametric methods and its application in biostatistics
- CO2. To understand the methods like bootstrapping and Jackknife methods and their application.
- CO3. To learn analysis and interpretation using nonparametric tests and how to report the finding of these tests in research publications.
- CO4. Strength of association using contingency tables
- CO5. Identify appropriate nonparametric tests for a real life situation and carry out the statistical analysis and interpret.

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## Second Semester

# STATISTICAL METHODS

- CO1. Basic knowledge on Statistics for students from Allied Programs
- CO2. An exposure to various concepts in statistics and their interpretation
- CO3. Training the students on the choice of basic statistical measures
- CO4. Use suitable statistical measures for specific problems and interpret the results.
- CO5. Demonstrate an application of the basic statistical measures and their interpretations with real life problems.

## SAMPLING METHODS AND DESIGN OF EXPERIMENT

- CO1. Understand the basic principles and concepts in design of experiment.
- CO2. To provide foundations on types of experimental designs
- CO3. Understand different experimental designs and their application in real life situation.
- CO4. Understand the basic concepts and theory related to different sampling methods.
- CO5. Application of sampling methods in biostatistics
- CO6. Identify appropriate sampling method for health surveys, carry out statistical computation and interpret based on the sample drawn.
- CO7. Identify suitable experimental design for the research problem and to carry out Statistical Analysis.

## EPIDEMIOLOGY


- CO1. Foundation on basics epidemiological study designs.
- CO2. Identifying the research problems and selection of appropriate research design
- CO3. To understand and distinguish between the concept of Bias, confounding and interactions.
- CO4. To understand basic epidemiological study designs that contribute the understanding of disease etiology.
- CO5. Understand and interpret various concepts under Epidemiological study.
- CO6. Translate the research objectives into clear, testable statistical hypothesis.
- CO7. Identify appropriate Epidemiological study design for the research problem and carryout the Statistical Analysis.

## APPLIED REGRESSION ANALYSIS

- CO1. To learn the basic methods in Regression analysis.
- CO2. Tools used to detect the problems such as multicollinearity, heteroscedasticity, autocorrelation in regression models.
- CO3. Statistical analysis of Bio-medical and health science data using appropriate regression methods
- CO4. Take up Case studies and carryout regression analysis.
- CO5. Apply regression analysis to identify significant factors influencing the response variables in real life situations.
- CO6. Use of regression methods as data analytic tool for the analysis of problems in biomedical research and Health science research and Bioinformatics.

## CATEGORICAL DATA ANALYSIS AND BAYESIAN METHODS

- CO1. Various basic concepts and tests used in categorical data analysis and Bayesian methods.
- CO2. An emphasis on the practical interpretation and communication of results to colleagues and clients who may not be statisticians
- CO3. Application of these techniques to problems in biomedical and healthscience research.
- CO4. Carry out frequency analysis of two way and higher order contingency tables, its interpretation in terms of measures of strength of association.
- CO5. To have good understanding of Baye's estimate and its credible intervals, choice of priors in obtaining it and testing of a statistical hypothesis.

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## DEMOGRAPHY & VITAL STATISTICS

- CO1. Various basic concepts on demography and vital statistics
- CO2. Necessary knowledge on the practical application of demography and vital statistics
- CO3. Acquire knowledge on life table, its construction, application and interpretation.
- CO4. Population projection and statistical models for measurement of population growth
- CO5. Describe the various concepts and results on Demography and vital statistics and work on the theoretical advancements on these topics.
- CO6. Construct life table and give interpretations.
- CO7. Calculate various measures of mortality and fertility.
- CO8. Demonstrate suitable growth models for population projection with real life data.

### Third Semester

## BASIC DATA ANALYSIS TECHNIQUES

- CO1. To learn various statistical tests and their application
- CO2. To Identifying appropriate test for analyzing real life problem.
- CO3. To learn procedures for verification of assumptions related to the tests.
- CO4. Verify the conditions and choose appropriate statistical test for testing of hypothesis related to specific real life problem.
- CO5. Interpret the computational results

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## **SURVIVAL ANALYSIS**

- CO1. Basics Knowledge in survival analysis and its application
- CO2. Analysis, interpretation and reporting of parametric and non-parametric methods used in survival analysis
- CO3. Regression models used in survival function
- CO4. Use of different models and Probability Distributions for the study of survival function
- CO5. Select appropriate Statistical model and method of estimation of survival function for real life situation.

## **METHODS IN CLINICAL TRIALS**

- CO1. Basic knowledge on various concepts in Clinical trials
- CO2. Basic knowledge on various types of drug trials
- CO3. Statistical principles, concepts and methods for the analysis of data in a clinical trial
- CO4. Explain the general principles of clinical trials and its implications for valid inference
- CO5. To design and carry out analysis of measurements at Phase 1, 2,3, and 4 clinical trials

## **HIERARCHICAL LINEAR AND HIERARCHICAL GENERALIZED LINEAR MODELS**

- CO1. To learn basic on Hierarchical linear and Hierarchical generalized linear models
- CO2. To understand the concepts, requirement of mixed models and its difference from usual linear and generalized linear models
- CO3. Identify appropriate design as Hierarchical linear and Hierarchical generalized linear models for the biomedical research and other health related study
- CO4. Apply the methods discussed in the analysis of data from longitudinal studies, complex surveys, cluster randomized trials and other sources of hierarchical data.

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## **GENETIC EPIDEMIOLOGY & BIOINFORMATICS**

CO1. Basic concepts of genetics epidemiology and Bioinformatics

CO2. Applications of statistical methods in Genetic Epidemiology and Bioinformatics

CO3: To study the various phenotypic variations in heritability and repeatability.

CO4: To study the genetic mapping and various genetic sequencing

CO5: Knowledge on common bioinformatics (nucleotide, protein, genome sequencing, RNA types and structure) databases and file formats.

## **PSYCHOMETRICS**

CO1. To learn about various Concepts in Psychometrics

CO2. To study principal component analysis and Factor analysis and their application in the analysis of Psychometric problems.

CO3. To learn structural equation modeling method and its application in the analysis of Psychometric problems.

CO4. To study the types of measures of reliability and item responses.

## TIME SERIES ANALYSIS

- CO1. To learn the basic concept of time dependent phenomenon and use of time series models in biomedical and health science research
- CO2. Various components of time series, their estimation and elimination
- CO3. Identification and analysis of appropriate time series model for the biological data
- CO4. Diagnostic checking of time series models and forecasting
- CO5. Identify appropriate time series model for the health science data and carry out diagnostic check
- CO6. Develop improved model depending upon the biomedical problem for better forecasted values
- CO7. Take up case studies and choose an appropriate time series model for the analysis

## NON-PARAMETRIC REGRESSION

- CO1. Basic idea of smoothing and different nonparametric regression methods
- CO2. Fitting nonparametric regression models for the biological data
- CO3. Work on the application of nonparametric regression methods for the biostatistician analysis of health science problems
- CO4. Choose an appropriate nonparametric method for the analysis of the data on hand
- CO5. Apply lack of fit tests for the suitability of the non parametric method.

## Fourth Semester

- CO1. Exclusively research project should be conducted to develop and enhance the theoretical and application skill which have learnt in all the three semesters.
- CO2. To understand various problems in data management, designs, analysis and interpretation.
- CO3. To study the background situation and apply appropriate Bio-statistical method to carry out biomedical project.

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