

BIOSTATISTICS (BIOSTAT)

BIOSTAT 301-0 Introduction to Epidemiology (1 Unit)

This course introduces epidemiology and its uses for population health research. Concepts include measures of disease occurrence, common sources and types of data, important study designs, sources of error in epidemiologic studies and epidemiologic methods.

BIOSTAT 302-0 Introduction to Biostatistics (1 Unit)

This course introduces principles of biostatistics and applications of statistical methods in health and medical research. Concepts include descriptive statistics, basic probability, probability distributions, estimation, hypothesis testing, correlation and simple linear regression.

BIOSTAT 303-0 Basic Probability (1 Unit)

This course introduces probability as the theoretical framework underlying statistical methods. Concepts include random variables, discrete and continuous probability distributions, multivariate distributions, and random variable transformations. A working knowledge of differential / integral calculus and matrix algebra fundamentals is required.

BIOSTAT 305-0 Applied Statistical Programming in SAS (1 Unit)

This course provides a thorough working introduction to the statistical programming language SAS. Concepts focus on practical issues relating to data management, statistical data processing and SAS programming.

BIOSTAT 306-0 R Programming (1 Unit)

This course provides a thorough working introduction to the statistical programming language R. Concepts focus on practical issues including: installing and configuring the RStudio development environment; loading and managing data in R; accessing R packages; writing R functions; writing R scripts; debugging and profiling R scripts; organizing and commenting R code; and developing dynamic analysis reports using R Markdown. Topics in biostatistical data analysis will provide relevant working examples.

BIOSTAT 401-0 Intermediate Epidemiology (1 Unit)

The purpose of this course is twofold: 1) To elaborate on concepts first introduced in introductory epi and demonstrate to students how these concepts are frequently in applied in biomedical literature; and 2) To provide students an overview of the physiology, pathophysiology, and epidemiology of prevalent diseases in the United States.

Prerequisite: BIOSTAT 301-0, BIOSTAT 302-0 or PUB_HLTH 302-0.

BIOSTAT 402-0 Intermediate Biostatistics (1 Unit)

This course provides an intermediate-level treatment of linear and logistic regression models, including model estimation and inference, model building and diagnostics, and interpretation of results in the context of epidemiologic and clinical studies. The focus is on practical application of regression models for data analysis. The course uses R statistical software for data analysis.

BIOSTAT 403-0 Statistical Inference and Applied Techniques (1 Unit)

This course introduces statistical inference concepts and applied statistical techniques for data analysis in a mathematical framework. Concepts include point and interval estimation, maximum likelihood, large sample theory, hypothesis testing, bootstrap methods, analysis of variance, linear regression, analysis of categorical data and Bayesian methods.

BIOSTAT 427-0 Practical Issues in Population Studies (0.5 Unit)

This course covers practical aspects of conducting a population-based research study. Concepts include determining a study budget, setting a timeline, identifying study team members, setting a strategy for recruitment and retention, developing a data collection protocol

and monitoring data collection to ensure quality control and quality assurance. Students will demonstrate these skills by engaging in a quarter-long group project to draft a Manual of Operations for a new "mock" population study.

BIOSTAT 429-0 Systematic Review and Meta-Analysis in the Medical Sciences (1 Unit)

This course covers statistical methods for meta-analysis. Concepts include fixed-effects and random-effects models, measures of heterogeneity, prediction intervals, meta regression, power assessment, subgroup analysis and assessment of publication bias. The course will emphasize basic theory and underlying statistical methods, computational approaches and interpretation of results from published studies.

BIOSTAT 445-0 Statistical Learning for Clinical, Translational, and Population Researchers (1 Unit)

Due to advances in technology and data collection, the ability to analyze complex data sets is a necessary skill for all clinical, translational and population researchers. A variety of data analysis tools exist, some unique to specific domains. This course provides an introduction to the data, analysis tools, ethical considerations, and terminologies from across biomedical data science with an emphasis on clinical, translational and population methods and tools.

BIOSTAT 499-0 Independent Study (0.5-1 Unit)

This Independent Study course is designed to give students a hands-on practical training on statistical analysis. This course will offer 4 statistical consultation projects – real case study. Students will be given the data and a brief introduction of the data. Students will need to check the data, perform preliminary data analysis, orally present their statistical approach, modeling, findings, and interpretation of their result, and write a report for each project. Students will be evaluated by the quality of their oral presentation and project report.

BIOSTAT 501-0 Advanced Epidemiology (1 Unit)

This course builds on material learned in previous Biostatistics and Epidemiology courses. Concepts are applied to the design, implementation, analysis and interpretation of observational epidemiologic studies (cross-sectional, case-control and cohort). Students enrolled in an MPH degree program must have the consent of the instructor.

Prerequisites: BIOSTAT 301-0, BIOSTAT 302-0, BIOSTAT 401-0, BIOSTAT 402-0.

BIOSTAT 502-0 Advanced Biostatistics (1 Unit)

This course covers modern approaches to the analysis of correlated response data arising from longitudinal studies commonly encountered in medical research and clinical trials. Concepts include marginal and mixed-effects regression models for continuous and discrete outcomes measured repeatedly over time, model building techniques, robust inference procedures and problems associated with missing data. All modeling and numerical analyses will be done using SAS. Prerequisites include the equivalent of BIOSTAT 302-0, BIOSTAT 402-0 .

BIOSTAT 521-0 Applied Survival Data Analysis (1 Unit)

This course provides an introduction to the fundamental concepts and methods developed for analysis of survival data for which incompleteness, including censoring, is a primary feature. Classic non-parametric estimation approaches will be discussed, as will semi-parametric and parametric hazard regression modeling techniques that allow incorporation of covariates. Analysis examples using both R and SAS will be discussed.

BIOSTAT 527-0 Statistical Methods for Missing Data (0.5 Unit)

This course provides students with a basic knowledge of the potential implications of missing data on their data analyses as well as potential solutions. A major focus of the course is multiple imputation including discussions of the general framework, different models and algorithms, and the basic theory. Statistical programming is performed in R.

BIOSTAT 529-0 Statistical Genetics (0.5 Unit)

This course equips students with key principles and practical skills to analyze genetic data. Topics range from linkage analysis using pedigree data to machine learning techniques using next-generation sequencing data. Statistical programming is performed in R.

BIOSTAT 560-0 Statistical Consulting (0.5 Unit)

This course prepares students for collaboration and communication with scientists of various disciplines, emphasizing analytical tools, verbal and written communication skills and presentation skills. Concepts include sample size and power calculation, handling of various data structures, data presentation, selecting appropriate statistical methods, time and project management, reproducible research, report writing and grant writing.

BIOSTAT 561-0 Thesis (0.5 Unit)

All MS in Biostatistics students are required to submit a master's thesis focusing on a collaborative data analysis or a statistical methodology advancement. Thesis projects are proposed in the fall, and content is developed primarily in late fall / winter. Written, poster and oral presentations are due in the spring.

BIOSTAT 565-0 Clinical Database Management (0.5 Unit)

This course serves as an introduction to data management in the clinical research setting. The Research Electronic Data Capture (REDCap) platform is used to understand basic database design, data management and quality monitoring concepts for studies ranging from simple cross-sectional designs to complex multi-center clinical trials.