

BIOSTATISTICS (BSTA)

509. Introduction to Epidemiology.

510. Introduction to Anatomy and Physiology. (A) ProPERT.

The purpose of this course is to introduce students without a background in medicine and biology to the basic vocabulary and principles of human anatomy and physiology in preparation for collaborative research in biostatistics. The course will begin with an overview of basic human biochemistry, cell biology, and genetics. Later topics will focus on the major organ systems including circulation, digestion and excretion, neurophysiology, and reproduction. Major disease areas of research such as cancer and drug research will also be covered.

620. (STAT430, STAT510) Probability I. (A) Morrison. Prerequisite(s): Two semesters of calculus (through multivariable calculus), linear algebra. This course is also offered in the Summer I session.

This course covers Elements of matrix algebra. Discrete and continuous random variables and their distributions. Moments and moment generating functions. Joint distributions. Functions and transformations of random variables. Law of large numbers and the central limit theorem. Point estimation: sufficiency, maximum likelihood, minimum variance, confidence intervals.

621. (STAT432, STAT512) Statistical Inference I. (B) Faculty. Prerequisite(s): BSTA 620.

Statistical inference including estimation, confidence intervals, hypothesis tests and non-parametric methods.

622. (STAT550) Statistical Inference II. (A) Brown. Prerequisite(s): BSTA 621.

Statistical inference including estimation, confidence intervals, hypothesis tests and non-parametric methods.

630. Statistical Methods for Data Analysis I. (A) Shults and Putt. Prerequisite(s): Multivariable calculus and linear algebra, BSTA 620 (may be taken concurrently).

This first course in statistical methods for data analysis is aimed at first year Biostatistics degree candidates. It focuses on the analysis of continuous data, and includes descriptive statistics, such as central tendencies, dispersion measures, shapes of a distribution, graphical representations of distributions, transformations, and testing for goodness of fit for a distribution. Populations, samples, hypotheses of differences and equivalence, and errors will be defined. One and two sample t-tests, analysis of variance, correlation, as well as non-parametric tests and correlations will be covered.

Estimation, including confidence intervals, and robust methods will be discussed. The relationship between outcome variables and explanatory variables will be examined via regression analysis, including single linear regression, multiple regression, model fitting and testing, partial correlation, residuals, multicollinearity. Examples of medical and biologic data will be used throughout the course, and use of computer software demonstrated.

631. Statistical Methods and Data Analysis II. (B) Gimotty. Prerequisite(s): linear algebra, calculus, BSTA 630, BSTA 620, BSTA 621 (may be taken concurrently).

This is the second half of the methods sequence and focuses on categorical data and survival data. Topics in categorical data to be covered include defining rates, incidence and prevalence, the chi-squared test, Fisher's exact test and its extension, relative risk and odds-ratio, sensitivity, specificity, predictive values, logistic regression with goodness of fit tests, ROC curves, Mantel-Haenszel test, McNemar's test, the Poisson model, and the Kappa statistic. Survival analysis will include defining the survival curve, censoring, and the hazard function, the Kaplan-Meier estimate, Greenwood's formula and confidence bands, the log rank test, and Cox's proportional hazards regression models. Examples of medical and biologic data will be used throughout the course, and use of computer software demonstrated.

651. Introduction to Linear Models and Generalized Linear Models. (B) Tu. Prerequisite(s): linear algebra, calculus, BSTA 630, BSTA 620, BSTA 621 (may be taken concurrently).

This course extends the content on linear models in BSTA 630 and BSTA 631 to more advanced concepts and applications of linear models. Topics include the matrix approach to linear models including regression and analysis of variance, general linear hypothesis, estimability, polynomial, piecewise, ridge, and weighted regression, regression and collinearity diagnostics, multiple comparisons, fitting strategies, simple experimental designs (block designs, split plot), random effects models, Best Linear Unbiased Prediction. In addition, generalized linear models will be introduced with emphasis on the binomial, logit and Poisson log-linear models. Applications of methods to example data sets will be emphasized.

690. Consulting Laboratory I. (C) Faculty. Prerequisite(s): BSTA 630.

Participation in the consulting laboratory is a requirement for both the Master's and Ph.D. degrees. This course covers general principles of statistical consulting and statistical consulting experience. There is training on statistical

programming, preparation of reports, presentations, and the communication aspects of consulting. Each student will be expected to join one of several project teams consisting of faculty, research staff, and graduate student consultants; attend meetings along with the project team and associated investigators; participate in all or part of the design, management, analysis and reporting stages of a project; and gain valuable experience in working with actual research projects.

752. Categorical Data Analysis II.

774. Statistical Methods for Evaluating Diagnostic Tests. (A) Gimotty. Prerequisite(s): BSTA 510, BSTA 630, BSTA 631 or equivalent; permission of instructor.

This course will cover statistical methodology for evaluating diagnostic tests. The topics will include: estimation of ROC curves, comparing multiple diagnostic tests, developing diagnostic tests using predictive models, measurement error effects on diagnostic tests, random effects models for multi-reader studies, verification bias in disease classification, methods for time-dependent disease classifications, study design issues, related software, and meta-analyses for diagnostic test data.

820. (STAT552) Statistical Inference III. (B) Faculty. Prerequisite(s): To be advised.

Statistical inference including estimation, confidence intervals, hypothesis tests and non-parametric methods.

EPIDEMIOLOGY (EPID)

Contact the department for information on courses offered in Epidemiology.

L/L 522. Probability and Estimation. Shults. Prerequisite(s): Permission of Instructor.

This course is the first of a four quarter sequence in Biostatistics at the introductory level. Topics covered include graphical methods, probability, discrete and continuous distributions, estimation, confidence intervals, and one sample hypothesis testing. Emphasis is placed on understanding the proper application and interpretation of the methods.

L/L 523. Inference and Linear Regression. (A) Cucchiara. Prerequisite(s): EPID 522 or Permission of Instructor.

This course is the second of a four quarter sequence in Biostatistics at the introductory level. Topics covered include two sample hypothesis testing, nonparametric techniques, sample size determination, correlation, regression, analysis of variance, and analysis of covariance. Emphasis is placed on understanding the proper application and underlying assumption of the methods presented. Laboratory sessions focus on the use of the STATA statistical package and applications to clinical data.

L/L 524. Biostatistics III. (A) Bilker. Prerequisite(s): EPID 522 and 523 or Permission of Instructor.

This course is the third of a four quarter sequence in Biostatistics at the introductory level. This quarter covers concepts in biostatistics as applied to epidemiology, primarily categorical data analysis, analysis of case-control, cross-sectional cohort studies, and clinical trials. Topics include simple analysis of epidemiologic measures of effect; stratified analysis; confounding; interaction, the use of matching and sample size determination. Emphasis is placed on understanding the proper application and underlying assumptions of the methods presented. Laboratory sessions focus on the use of STATA and other statistical packages and applications for clinical data.

L/L 525. Biostatistics for Epidemiologic Methods II. (B) Faculty. Prerequisite(s): EPID 522, 523 and 524 or permission of instructor.

This course is the fourth of a four quarter sequence in Biostatistics at the introductory level biostatistics. This quarter covers concepts in biostatistics as applied to epidemiology, primarily multivariable models in epidemiology for analyzing case-control, cross-sectional, cohort studies, and clinical trials. Topics include logistic, conditional logistics, and Poisson regression methods; simple survival analyses including Cox regression. Emphasis is placed on understanding the proper application and underlying assumptions of the methods presented. Laboratory sessions focus on the use of the STATA and other statistical packages and applications to clinical data.

545. Found Comm Oriented Research.

623. Applied Survival Analysis.

SM 633. Advanced Database Management for Clinical Research. Holmes.

This course is intended to provide in-depth, practical exposure to the design, implementation, and use of secondary data resources in clinical research. This course is intended to provide students with the skills needed to design and conduct a research project using secondary data, with a focus on data management. We will focus on analysis only to th

extent that one needs to be aware of the demands that particular analytic strategies put on the structure and management of data.

656. Research Methods in ID Epidemiology.

658. Gastroenterology EPI.

690. Ethical Issues In Clinical Research.

SM 714. Grant Writing/Review. Farrar. Prerequisite(s): EPID510, EPID520, EPID 560, and EPID 570.

This course is designed to provide background, and guidance on writing and submitting NIH grants. Students will submit a mini proposal at the beginning of the term. Each proposal will be reviewed by a group of 3 students from the class and scores will be given. The final project will be a full NIH proposal ready for submission.

805. Practicum In Applied Clinical Research Methods.

813. Biostatistics in Practice Lab. Faculty.

SM 816. Economic Evaluation of Medical Therapies. Faculty.