PUBLIC HEALTH - BIOSTATISTICS (PHST)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes (https://csprd.louisville.edu/psp/ps_class/EMPLOYEE/PSFT_CS/c/COMMUNITY_ACCESS.CLASS_SEARCH./x/?state=62dab551a0d600a5e8237359c50704e59007&duo_code=sjUx2OSTj21bWWEuQ3ZpYBjHzdfqqu0).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website (https://louisville.edu/bursar/tuitionfee/university-fees/).

PHST 500. Introduction to Biostatistics for Health Sciences I   3 Units
Term Typically Offered: Fall Only
Prerequisite(s): Enrolled as a student in the PH MPH, MSc or Certificate in Clinical Investigation Sciences program.
Description: An introduction to descriptive and inferential statistical methods, including descriptive and graphical methods, estimation, calculation of confidence intervals, and 1- and 2-sample hypothesis testing, one-way analysis of variance (ANOVA), and simple linear regression. The R statistical software environment will be used to introduce data management and descriptive and inferential statistical methods.
Note: Students interested in this course that do not meet the stated prerequisites should contact the department of Bioinformatics and Biostatistics.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 501. Introduction to Biostatistics for Health Sciences II   3 Units
Prerequisite(s): PHST 500.
Description: This course is a continued graduate level introduction to inferential statistical methods, covering multi-way analysis of variance, multiple regression, the chi-square analysis of frequencies and logistic regression, survival analysis, and nonparametric statistical methods. A statistical software package will be used to execute the descriptive, graphical, and inferential statistical techniques on real data sets.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 520. Statistical Computing and Data Management with SAS 3 Units
Term Typically Offered: Spring Only
Prerequisite(s): PHST 301, or equivalent (MATH 109, SOC 301, PSYC 301, PAS 408).
Description: This course will introduce students to the fundamental of data management and analysis using SAS. It will give an overview of the SAS system under MS Windows and provide a fundamental grounding in the data step and Base SAS procedure. We will cover elementary statistical analyses such as measures of location and spread, correlation, detection of outliers, graphical displays, comparison of groups, as well as additional specialized studies.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 561. Mathematical Tools I   1 Unit
Term Typically Offered: Summer Only
Prerequisite(s): Conditional or full admission to the MS or Certificate in Biostatistics programs.
Description: This course covers mathematical tools required for sound comprehension of mathematical probability and statistics concepts included in methodological portions of coursework in the MS in Biostatistics degree. Course topics include: (1) functions and graphs with particular focus on polynomials and roots, rational functions, and exponential and logarithmic functions, and (2) limits and continuity of functions.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 562. Mathematical Tools II   1 Unit
Term Typically Offered: Summer Only
Prerequisite(s): Conditional or full admission to the MS or Certificate in Biostatistics programs.
Description: This course covers mathematical tools required for sound comprehension of mathematical probability and statistics concepts included in methodological portions of coursework in the MS in Biostatistics degree. Course topics include: (1) first and higher order differentiation of single variable functions and techniques for differentiation, (2) applications of differentiation including identification of minima, maxima, and inflection points, (3) antiderivatives, the definite integral, and the Fundamental Theorem of Calculus, (4) techniques of integration including substitution, integration by parts, etc.; using integrals to compute areas, and (5) sequences and series, convergence of each, partial and infinite sums, geometric series, Taylor series.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 563. Mathematical Tools III   1 Unit
Term Typically Offered: Summer Only
Prerequisite(s): Conditional or full admission to the MS or Certificate in Biostatistics programs.
Description: This course covers mathematical tools required for sound comprehension of mathematical probability and statistics concepts included in methodological portions of coursework in the MS in Biostatistics degree. Course topics include: (1) multivariable functions, limits, and continuity, (2) partial differentiation and its applications, and (3) multiple integration and its applications.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 564. Mathematical Tools IV 1 Unit
Term Typically Offered: Summer Only
Prerequisite(s): Conditional or full admission to the MS or Certificate in Biostatistics programs.
Description: This course covers mathematical tools required for sound comprehension of mathematical probability and statistics concepts included in methodological portions of coursework in the MS Biostatistics degree. Course topics include (1) vector/matrix algebra and operations, (2) solving systems of linear equations, (3) vector spaces, linear independence, rank, and basis, (4) eigenvalues and eigenvectors, (5) orthogonal vectors and projections, (6) quadratic forms.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 602. Biostatistics Seminar 1 Unit
Prerequisite(s): Enrolled in the PhD or MS in Biostatistics, PH MPH, Math major in Graduate School.
Description: Weekly seminar series for MS and PhD Biostatistics students. Students will hear speakers present their current research in bioinformatics and biostatistics and report on the work.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 603. Biostatistics Public Health Practicum I 1-2 Units
Prerequisite(s): Enrolled in MS in Biostatistics, PH MPH or Math major in Graduate School.
Description: Practical experience in biostatistical collaboration at the master's level, in which a student works with one or more investigators in the health sciences. Students typically engage in the statistical analysis of investigator data sets and are required to generate and present a report to the collaborating investigators.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 604. Biostatistics 1-2 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): PHST 603.
Description: Practical experience in biostatistical collaboration at the master's level, in which a student works with one or more investigators in the health sciences. Students typically engage in the statistical analysis of investigator data sets and are required to generate and present a report to the collaborating investigators.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 620. Introduction to Statistical Computing 3 Units
Term Typically Offered: Fall Only
Prerequisite(s): PHST 500 or enrolled in MS or Certificate in Biostatistics or MS in Health Data Analytics programs.
Description: This course provides an introduction to SAS. It will give students an overview of the SAS system under MS Windows and provide fundamental grounding in the environment for accessing, structuring, formatting and manipulating data. Students will learn how to summarize and display data, and the inference between data steps and procedures to get information out of data.
Note: Students interested in this course that do not meet the stated prerequisites should contact the department of Bioinformatics and Biostatistics.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 624. Clinical Trials I: Planning and Design 2 Units
Term Typically Offered: Fall Only
Prerequisite(s): Enrollment in the MS or Certificate in Biostatistics or the MSc or Certificate in Clinical Investigation Sciences.
Description: Phases of Trials, Ethical Issues, Basic Design, Inclusion and Exclusion criteria, Randomization and Blinding, Sample Size, Monitoring Response Variables, and Issues in Data Analysis
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 625. Clinical Trials II 2 Units
Prerequisite(s): PHST 624.
Description: Sample Size and Power Analysis, Survival Analysis, Sequential Design, Meta Analysis, Reporting and Interpreting of Results, Multicenter Trails. SPSS will be used.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 631. Data Collection for Clinical Research 2 Units
Term Typically Offered: Fall Only
Prerequisite(s): Enrolled in the MSc in Clinical Investigation Sciences or the Certificate in Clinical Investigation Sciences program and PHST 500 completed or concurrent.
Description: This course covers the identification and selection or design and analysis of instruments for collecting data used in clinical research. Psychometric/biometric properties of data collected using instruments are addressed extensively. REDCap (Research Electronic Data Capture) and SPSS will be used extensively.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 640. Statistical Methods for Research Design in Health Sciences 3 Units
Term Typically Offered: Spring Only
Prerequisite(s): Enrollment in the MS or Certificate in Biostatistics, or PHST 500.
Description: Statistical methods for clinical research and interpretation of the literature.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

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PHST 645. Health Sciences Data Collection Instrumentation   3 Units
Prerequisite(s): Enrollment in the MS in Biostatistics, or PHST 500 completed or concurrent.
Description: This course covers the identification and selection or design and analysis of instruments for collecting data used in health sciences research and evaluation. Psychometric/biometric properties of data collected using instruments are addressed extensively. Epi Info 7 will be used to develop data collection instruments and SPSS will be used for data management and analysis. This will be taught as a hybrid course.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 650. Advanced Topics in Biostatistics   1-3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): Permission from the instructor.
Description: A treatment of one or more topics in advanced biostatistics not usually covered in a regularly offered course.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 655. Basic Statistical Methods for Bioinformatics   3 Units
Term Typically Offered: Fall Only
Prerequisite(s): Must earn higher than a C- in PHST 681 and enrollment in MS in Biostatistics degree program.
Description: This course provides an introduction to some core topics in bioinformatics. Topics will include-pairwise and multiple sequence alignment algorithms; gene expression profiling using microarrays; introduction to next generation sequencing; analyzing RNA-Seq data and phylogenetics. Students are expected to be familiar with some elementary statistics and probability concepts.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 660. Mathematical Tools   4 Units
Prerequisite(s): Enrolled in MS in Biostatistics and MATH 190 or equivalent.
Description: This course focuses on the basic techniques of differential and integral calculus, and matrix algebra. Topics include the chain rule, higher-order derivatives, partial derivatives, improper integrals, multiple integrals, sequences and series, vector and matrix arithmetic, and eigenvalues.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 661. Probability   3 Units
Term Typically Offered: Fall Only
Prerequisite(s): Full admission to the MS in Biostatistics or Math major in Graduate School or enrolled in the MS in Health Data Analytics program.
Description: Introduction to probability theory. Topics include axioms of probability, conditional probability, discrete and continuous random variables, probability distributions and joint distributions, moments, moment generating functions, mathematical expectation, transformations of random variables, limit theorems (Law of Large Numbers and Central Limit Theory).
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 662. Mathematical Statistics   3 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): Must earn higher than a C- in PHST 661 and enrolled in the MS in Biostatistics program.
Description: A first course in statistical theory. Topics include limiting distributions, maximum likelihood estimation, least squares, sufficiency and completeness, confidence intervals, Bayesian estimation, Neyman-Pearson Lemma, uniformly most powerful tests, likelihood ratio tests and asymptotic distributions.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 666. Master's Thesis Research   1-6 Units
Prerequisite(s): Enrolled in the MS in Biostatistics or Math major in Graduate School; accumulation of at least 18 hours of PHST credit hours.
Description: Mentored research; Thesis Preparation.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 671. Special Topics in Biostatistics   1-3 Units
Prerequisite(s): Enrolled in the MS in Biostatistics or Math major in Graduate School.
Description: A treatment of one or more topics in advanced Biostatistics not usually covered in a regularly offered course. May be repeated under different subtitles.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 675. Independent Study in Biostatistics   1-3 Units
Prerequisite(s): PHST 661 and enrolled in the MS in Biostatistics or Math major in Graduate School.
Description: Course allows students to pursue advanced study with faculty guidance on a topic related to biostatistics.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 680. Biostatistical Methods I   3 Units
Term Typically Offered: Fall Only
Prerequisite(s): Enrollment in the MS or Certificate in Biostatistics or Math major in Graduate School, or PHST 501.
Description: A mathematically sophisticated presentation of statistical principles and methods. Topics include exploratory data analysis, graphical methods, point and interval estimation, hypothesis testing, and categorical data analysis. Matrix algebra is required. Data sets drawn from biomedical and public health literature will be analyzed using statistical computer packages.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 681. Biostatistical Methods II   3 Units
Term Typically Offered: Spring Only
Prerequisite(s): Must earn higher than a C- in PHST 680.
Description: This course offers a mathematically sophisticated introduction to simple regression models and analysis of variance. Matrix algebra is required and data analysis will be illustrated drawing examples from biomedical and public health literature.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 682. Multivariate Statistical Analysis **3 Units**
Term Typically Offered: Fall, Spring
Prerequisite(s): Must earn higher than a C- in PHST 662.
Description: The topics covered in this course include the multivariate normal distribution, inference for mean vectors, inference for covariance and correlation matrices, analysis of covariance structure, analysis of serial measurements, factor analysis, and discriminant analysis. Statistical methods and models that are most useful in multivariate data analysis will be introduced. Instruction will also be given in the proper use of R to carry out these analyses.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 683. Survival Analysis **3 Units**
Term Typically Offered: Fall Only
Prerequisite(s): Must earn higher than a C- in PHST 662 and PHST 681.
Description: Statistical methods for analyzing survival data. Parametric and nonparametric methods for complete and incomplete data, life-table, KM estimator, accelerated lifetime models, proportional hazard models, log-rank tests, and goodness-of-fit tests.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 684. Categorical Data Analysis **3 Units**
Term Typically Offered: Spring Only
Prerequisite(s): Must earn higher than a C- in PHST 680.
Description: Topics include inference for two-way contingency tables, models for binary response variables, log-linear models, models for ordinal data, multinominal response data, Poisson regression and analysis of repeated categorical response data. Emphasis will be placed on methods and models most useful in biomedical and public health research.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 691. Bayesian Inference and Decision **3 Units**
Prerequisite(s): PHST 681 and enrolled in the PhD or MS in Biostatistics or Math major in Graduate School.
Description: Focuses on the use of Bayesian probability and statistics in both scientific inference and formal decision analysis. The frequency and subjective interpretations of probability are explored, as well as probability and decision making. The course will explore inference for both single-parameter, multiple-parameter, and hierarchical models. A significant amount of time will be devoted to Bayesian computational methods.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 703. Biostatistical Consulting Practicum **1-3 Units**
Prerequisite(s): Enrollment in the PhD in Biostatistics program and completion of PHST 710, PHST 762, PHST 781, and PHST 691.
Description: In depth practical experience in biostatistical collaboration at the doctoral level, in which a student works with one or more investigators in the health sciences. Students typically engage in the statistical analysis of investigator data sets and are required to generate and present a report to the collaborating investigators.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 704. Mixed Effect Models and Longitudinal Data Analysis **3 Units**
Prerequisite(s): Enrollment in the PhD in Biostatistics program and PHST 781.
Description: The course focuses on theory and application of linear and nonlinear mixed effect models, particularly, the application of mixed models to longitudinal data analyses.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 710. Advanced Statistical Computing I **3 Units**
Term Typically Offered: Fall Only
Prerequisite(s): Enrolled in the MS or PhD in Biostatistics and earn higher than a C- in PHST 681.
Description: The intent of this course is to develop knowledge of a statistical programming language and computational methods that are essential to statistics. The course primarily focuses on the R programming language and covers a variety of programming topics related to R (vectorization, data I/O, object-oriented programming, and building R packages). Statistical and computational methods that are covered include visualization (basic and lattice graphics), data smoothing, optimization (Newton-Raphson and EM-algorithm), matrix factorization, simulation (inverse transform and acceptance-rejection methods, power and size of a test), numerical integration, resampling (bootstrap and permutation tests), and other modern statistical methods.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 711. Advanced Statistical Computing II **3 Units**
Prerequisite(s): Enrolled in the MS or PhD in Biostatistics and PHST 710.
Description: This is a continuation of the statistical programming techniques, skills, and theory covered in PHST 710. The intent of this course is to further develop your ability to perform statistical programming. This includes carrying-out computational tasks, interfering with diverse data types and formats, and writing functions to implement statistical methods. Potential topics include multivariate optimization, C++ programming in R, statistical learning methods, non-parametric smoothing, dimension reduction/variable selection, and Markov Chain Monte Carlo (MCMC) methods. Additionally, the course may cover computing concepts such as cross-validation/resampling, regular expressions, and computing on the R language.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 724. Advanced Clinical Trials **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 624 and PHST 681 or equivalent.
Description: Advanced statistical methods for design and analysis of clinical trials are explored. Content includes design and analysis of complex clinical studies, including phases I, II, and III clinical trials for dichotomous, normally distributed and time-to-event outcomes. SAS, R and EAST will be extensively used.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 725. Design of Experiments   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 681 or equivalent.
Description: The course introduces experimental design principles and covers specific designs in detail. Concepts will be illustrated using examples from the health services and engineering. SAS in R will be extensively used.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 750. Statistics for Bioinformatics   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 661.
Description: This course focuses on the statistical methods and computational tools for analyzing data generated from DNA and protein sequences, genetic maps, and polymorphic marker data. This course will review the basics of genetics/molecular biology and statistical inference and probability needed for analyzing DNA and protein sequences. Covered topics include introduction to stochastic processes, analysis and motif discovery within a single DNA/protein sequence, comparison and alignment of two or more DNA/protein sequences, the foundations of substitution matrices, the statistical underpinnings of BLAST, hidden Markov models, evolutionary models, and phylogenetic trees. This course is developed for individuals interested in pursuing research in computational biology, genomics, and bioinformatics. Students are expected to be familiar with some elementary statistics and probability concepts.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 751. High-throughout Data Analysis   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 661.
Description: The array of high speed, high dimension and highly automated biotechnical equipment including next generation DNA sequencers (NGS), microarray, and metabolomics and proteomic analyzers (mass spectrometers) are all designed to capture and process vast amounts of biological data. All these data generation platforms require customized statistical analyses dealing with high dimensional data. In this course we will introduce the statistical methodologies needed to analyze the data generated by these high-throughput technologies. Covered statistical topics include modern methods for classification, dimension reduction/variable selection methods, and clustering. The course will also cover practical aspects of high-throughput data analysis including microarray data, NGS data, and proteomic mass-spectrometer data.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 752. Statistical Genetics   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 681.
Description: This course covers the principles of Mendelian genetics, linkage analysis, association analysis, and quantitative trait models. The main goal is to provide the students a foundation of the statistical theory of inheritance and enough expertise to analyze and interpret genetic association studies.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 762. Advanced Statistical Inference   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 662.
Description: This course is a mathematically sophisticated introduction to the theory and methods of statistical inference, including point and interval estimation and hypotheses testing. Students will learn fundamental technical tools that are essential to carry out methodological research in the field of Biostatistics. Emphasis will be placed on how to correctly propose statistical methods with desirable properties in a general setting including asymptotic unbiasedness, robust variance estimation and efficiency.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 777. Dissertation Research   **1-12 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics, satisfactory completion of PhD qualifying examination, and permission of dissertation director.
Description: The PhD student may take a total of up to 24 hours credit for the planning, data collection, analysis, and writing of the research project that results in the doctoral dissertation. PHST 777 must be taken under the direction of the student's major professor. Dissertation research hours are seen as a major component of the doctoral program.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 780. Advanced Nonparametrics   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 662.
Description: This course is a mathematically advanced introduction to theory and methods of nonparametric statistics. The first part of the course covers topics including theory of distribution-free statistics based on ranking, U-statistics, Kolmogorov-Smirnov one-sample statistics, Chi-square goodness-of-fit test, asymptotic relative efficiency. The second part of the course covers nonparametric density and regression estimation based on kernel, splines, local polynomial and wavelet methods.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 781. Advanced Linear Models   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 662.
Description: An introduction to the theory of linear models, with an emphasis on health sciences applications. Topics include projections, distributions of quadratic forms under normality, estimation procedures, general linear hypotheses, estimating and testing linear parametric functions, simultaneous inference, multifactor ANOVA models, and covariance.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 782. Generalized Linear Models   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 781.
Description: The course covers the advanced statistical methods and inferences based on the exponential family of distributions, with linear model, logistic regression model, and log-linear as its special cases. Generalized estimating equations for correlated responses are also covered.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

PHST 783. Advanced Survival Analysis   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics; PHST 662 and
PHST 683.
Description: This course is a mathematically advanced introduction to
the theory and methods of survival analysis. It offers an in-depth analysis
of parametric and non-parametric models for general event-time data. It
also provides a brief overview of complex models like multi-state models
and competing risks.
For class offerings for a specific term, refer to the Schedule
of Classes (http://htmlaccess.louisville.edu/classSchedule/
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PHST 785. Nonlinear Regression   **3 Units**
Prerequisite(s): Enrolled in the PhD in Biostatistics and PHST 781.
Description: The course covers advanced statistical methods for non-
linear regressions. Linear models, generalized linear models, and least
squares estimates will be reviewed. The least squares estimates,
algorithm for obtaining the estimates, statistical inferences, and model
diagnostic tests for nonlinear regression models will be covered.
For class offerings for a specific term, refer to the Schedule
of Classes (http://htmlaccess.louisville.edu/classSchedule/
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