The Department of Biostatistics at the University of Alabama at Birmingham (UAB) is one of five departments in the School of Public Health: Biostatistics, Environmental Health Science, Epidemiology, Health Behavior, and Health Care Organization and Policy. Dr. Lloyd Edwards is the Chair of the department, Dr. Jeff M Szychowski is the Director of Graduate Studies, and Ms. Della Daniel is the department liaison to the graduate program. The department currently has 18 faculty members and includes concentrations in research methods, statistical genetics and clinical trials. Members of the department conduct research in statistical methodology and applications, as well as in fundamental problems of modeling in biological systems. Much of the department’s research is collaborative in nature involving projects from basic science, genetics, clinical medicine, public health, and other health-related areas, both within and outside of UAB. Grant support for faculty in the department fall into four broad areas: 1) applied grants involving the application of statistical methods to health-related issues, 2) statistical coordinating centers for large multi-center randomized clinical trials, 3) methodological grants advancing statistical techniques, and 4) training grants for preparing the next generation of statisticians.

### Degree Programs

The Department offers programs leading to the Doctor of Philosophy (PhD), Master of Science (MS), Master of Public Health (MPH), and a Master of Science in Public Health (MSPH). The MS and PhD degrees are offered through the Graduate School. The MPH and MSPH degrees are offered through the School of Public Health.

**Biostatistics Degree Competencies**

- [click here](http://www.soph.uab.edu/BST_competencies)

### Admissions

<table>
<thead>
<tr>
<th>Entry Term</th>
<th>Deadline</th>
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</thead>
<tbody>
<tr>
<td>Master Program Deadline:</td>
<td><a href="http://www.soph.uab.edu/apply">www.soph.uab.edu/apply</a></td>
</tr>
<tr>
<td>PhD Program Deadline:</td>
<td>May 1 (U.S.), April 1 (International)</td>
</tr>
<tr>
<td>Number of Evaluation Forms Required:</td>
<td>Three</td>
</tr>
<tr>
<td>Entrance Tests: GRE</td>
<td><a href="http://www.soph.uab.edu/apply">www.soph.uab.edu/apply</a></td>
</tr>
</tbody>
</table>

**TOEFL:**

TOEFL is required for international applicants whose native language is not English.

**GPA:**

3.0

**International Transcripts:**

International transcripts must be submitted to World Education Services (WES) or Educational Credential Evaluators (ECE) for an official course-by-course credential evaluation (document-by-document evaluations will not suffice).

**SOPH Admissions:**

[www.soph.uab.edu/apply](http://www.soph.uab.edu/apply)

UAB has many degree programs (both on-campus and online) that can lead to professional licensure or certification (PLC). Licensure requirements vary from state to state and by professional organization. UAB is working to develop an online, publically-accessible database, to assist in providing this state-by-state information. In the meantime, if you are interested in learning about potential professional licensure requirements in your state for a specific degree program, please contact the UAB State Authorization Office at stateauth@uab.edu or call Dr. Lisa Reburn (205) 934-3258.

### Master of Science in Biostatistics

The Department of Biostatistics ([http://www.soph.uab.edu/bst/degree-programs](http://www.soph.uab.edu/bst/degree-programs)) offers an MS degree in Biostatistics. This program provides a balance between theory and application, the perspective being the role of statistics and modeling in scientific research. The objective is to produce research-oriented scientists who anticipate a career performing data management and statistical analysis. Further, the MS program is the appropriate program to prepare students to enter the PhD program.

For admission to the program applicants should have a strong academic record and meet the minimum requirements for admission to the School of Public Health. ([http://www.soph.uab.edu/graduate/prospective](http://www.soph.uab.edu/graduate/prospective)) In addition, the applicant’s prior collegiate curriculum must include a 3-semester sequence of calculus or equivalent and linear algebra. Proficiency in computing is preferred, as are additional advanced mathematics courses, e.g., differential equations, advanced calculus including special functions, and complex analysis. Some background in the natural sciences would be helpful. The Department of Biostatistics admits MS students in the fall term each year. Interested students should apply online through the **UAB Graduate School**.

All students are required to complete a 37 hour, self-paced online course entitled “Overview of Public Health” by the end of their second semester. Students with prior public health education (coursework in each of the public health core disciplines) or experience (5 years in public health) may be waived from this requirement by permission of the Associate Dean.

### Requirements

<table>
<thead>
<tr>
<th>MS Required Courses:</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BST 621 Statistical Methods I</td>
<td>3</td>
</tr>
<tr>
<td>BST 622 Statistical Methods II</td>
<td>3</td>
</tr>
<tr>
<td>BST 623 General Linear Models</td>
<td>3</td>
</tr>
<tr>
<td>BST 626 &amp; 626L Data Management and Reporting with SAS</td>
<td>3</td>
</tr>
<tr>
<td>BST 631 Statistical Theory I</td>
<td>4</td>
</tr>
</tbody>
</table>
**Master of Science in Public Health (MSPH) in Clinical and Translational Science (CTSB)**

Master of Science in Public Health in Clinical and Translational Science (http://www.soph.uab.edu/bst/degree-programs) (CTSB) is an applied statistics degree with a focus on Public Health. This program is open to all qualified applicants with relevant undergraduate, masters, medical, or health science professional degree. For fellows and faculty members interested in developing skills required for clinical research, this program is an ideal post-medical or other health science degree training program. It is anticipated that this academic training will supplement extensive training in the content area in which the student is trained, and senior mentoring in the politics and policies of development and management. A graduate of this program will have the academic training to develop and lead independent research programs and projects.

For admission to the MSPH program applicants should have a strong academic record and meet the minimum requirements to the School of Public Health (http://www.soph.uab.edu/graduate/prospective). In addition, the applicant's undergraduate curriculum must include a 2-semester sequence of calculus or equivalent, linear algebra, and proficiency in computing. The Department of Biostatistics admits MSPH students in the fall term each year. Interested students should apply online through the UAB Graduate School.

**Curriculum**

The MSPH in Clinical and Translational Science consists of a minimum of 41 credit hours. Of these, 20 hours are required, including 15 hours of specific biostatistics courses and 5 hours of specific epidemiology courses. Students then select at least 9 hours from a list of approved Masters Research Electives, complete 3 hours of focus specific electives in biostatistics, and take at least 9 hours of directed (698 level) masters research to fulfill the MSPH requirement for conducting a research project.

All students are required to complete a 37 hour, self-paced online course entitled “Overview of Public Health” by the end of their second semester. Students with prior public health education (coursework in each of the public health core disciplines) or experience (5 years in public health) may be waived from this requirement by permission of the Associate Dean.

**Requirements**

<table>
<thead>
<tr>
<th>Biostatistics Electives (Minimum 6 credit hours):</th>
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<tbody>
<tr>
<td>BST Courses 2</td>
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<tr>
<td>6</td>
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<tr>
<td>Required Outside Electives (Minimum 7 graduate credit hours of electives):</td>
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<tr>
<td>EPI 610 Principles of Epidemiologic Research</td>
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<tr>
<td>Other Elective</td>
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<tr>
<td>3</td>
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<tr>
<td>Other Related Courses including BST 698 (Minimum of 6 credit hours):</td>
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<tr>
<td>BST 698 Non Thesis Research</td>
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<tr>
<td>6</td>
</tr>
<tr>
<td>Total Hours: 46</td>
</tr>
</tbody>
</table>

1  BST 691 - Minimum 4 hours required.

2  BST Elective: BST 665 Survival Analysis is highly recommended.

**Doctor of Philosophy in Biostatistics**

The Department of Biostatistics (http://www.soph.uab.edu/bst/degree-programs) offers a PhD degree in biostatistics. This program provides a balance between theory and application, the perspective being the role of statistics and modeling in scientific research. The objective is to produce research-oriented scientists who can advance statistical and modeling theory and can interact effectively with scientists in other disciplines to advance knowledge in those fields.

For admission to the program applicants should have a strong academic record and meet the minimum requirements for admission to the School of Public Health. (http://www.soph.uab.edu/graduate/prospective) In addition, the applicant's prior collegiate curriculum must include a 3-semester sequence of calculus or equivalent and linear algebra. Proficiency in computing is preferred, as are additional advanced mathematics courses, e.g., differential equations, advanced calculus including special functions, and complex analysis. Some background in the natural sciences would be helpful. In most cases, a prior MS in biostatistics, statistics, or related field are required for admission to the PhD program. Students with a bachelor's degree are encouraged to pursue a MS degree in Biostatistics before applying to the PhD program. The Department of Biostatistics admits PhD students in the fall term each year. Interested students should apply online through the UAB Graduate School (https://uabim Birmingham.force.com/graduate/TX_SiteLogin?startURL=%2Fgraduate%2FTargetX_Portal__PB).
Curriculum

To earn the PhD degree in Biostatistics students must complete a minimum of 88 total credit hours of academic course work. Of these, 45 hours are required core courses and 3 hours are required Graduate School courses. Students then select a minimum 9 credit hours of regular Biostatistics Elective courses of 624 or higher level; a minimum 7 graduate credit hours of outside electives must be taken from a non-quantitative field (i.e. Biology, Public Health or Medicine) with advisor’s approval and in some cases, also approval of instructor; and at least 24 credit hours of other related courses including dissertation research.

All students are required to complete a 37 hour, self-paced online course entitled “Overview of Public Health” by the end of their second semester. Students with prior public health education (coursework in each of the public health core disciplines) or experience (5 years in public health) may be waived from this requirement by permission of the Associate Dean.

Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Required Biostatistics Courses (45 hours):</td>
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<tr>
<td>BST 621 Statistical Methods I</td>
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<tr>
<td>BST 622 Statistical Methods II</td>
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<tr>
<td>BST 623 General Linear Models</td>
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<tr>
<td>BST 625 Data Management and Reporting with SAS</td>
<td>3</td>
</tr>
<tr>
<td>BST 665 Survival Analysis</td>
<td>3</td>
</tr>
<tr>
<td>BST 691 Pre-Doctoral Seminar Series¹</td>
<td>1</td>
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<tr>
<td>BST 691 Pre-Doctoral Seminar Series</td>
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<td>BST 691 Pre-Doctoral Seminar Series</td>
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<td>BST 691 Pre-Doctoral Seminar Series</td>
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<tr>
<td>BST 723 Theory of Linear Models</td>
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<tr>
<td>BST 735 Advanced Inference</td>
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<tr>
<td>BST 760 Generalized Linear and Mixed Models</td>
<td>3</td>
</tr>
<tr>
<td>BST 765 Advanced Computational Methods</td>
<td>3</td>
</tr>
<tr>
<td>Graduate School Requirement (3 hours):¹</td>
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<tr>
<td>GRD 717 Principles of Scientific Integrity</td>
<td>3</td>
</tr>
<tr>
<td>Biostatistics Electives (minimum 9 hours of 700 level courses):</td>
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<tr>
<td>BST courses</td>
<td>9</td>
</tr>
<tr>
<td>Required Public Health/Medical/Biological Electives (minimum 7 credit hours):</td>
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<tr>
<td>EPI 610 Principles of Epidemiologic Research</td>
<td>4</td>
</tr>
<tr>
<td>Elective</td>
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<tr>
<td>Other Related Courses including Research in Statistics (BST 698/798):</td>
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<tr>
<td>BST 798 Non-Dissertation Research</td>
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</tr>
<tr>
<td>Other Related Courses including Dissertation Research (BST 799):³</td>
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<tr>
<td>BST 799 Dissertation Research</td>
<td>1-12</td>
</tr>
<tr>
<td>Minimum Credit Hours</td>
<td>88</td>
</tr>
</tbody>
</table>

¹ At least one (1) course related to research ethics and scientific integrity. Does not count toward the required 24 credit hours of didactic course work.

² BST 691 - minimum 6 hours required
³ Two semesters in candidacy and either (1) 24 credit hours of BST 799 or (2) 12 credit hours of BST 799 and 12 credit hours of research-based coursework (approved by Program Director)

Courses

**BST 601. Biostatistics. 4 Hours.**

Logic and language of scientific methods in life science research; use of basic statistics in testing hypotheses and setting confidence limits. Simple and multiple regression and elementary experimental designs. BST 601 is a 4-credit course for MPH students. There are no formal prerequisites for this course; however, familiarity and comfort with basic mathematical concepts is essential. The minimum technical skills required include the ability to use Adobe Acrobat, Word, Excel, and PowerPoint. If you are deficient in any of these areas, it is your responsibility to improve your skills before starting the course.

**BST 601Q. Biostatistics Online. 4 Hours.**

Logic and language of scientific methods in life science research; use of basic statistics in testing hypotheses and setting confidence limits. Simple and multiple regression and elementary experimental designs. No prerequisites but familiarity with basic algebra is important. BST 601 is a 4-credit course for MPH students. There are no formal prerequisites for this course; however, familiarity and comfort with basic mathematical concepts is essential. The minimum technical skills required include the ability to use Adobe Acrobat, Word, Excel, and PowerPoint. If you are deficient in any of these areas, it is your responsibility to improve your skills before starting the course.

**BST 603. Introductory Biostatistics for Graduate Biomedical Sciences. 3 Hours.**

This course will utilize current statistical techniques to assess and analyze health science related data.

**BST 607. Environmental Sampling and Exposure Assessment. 3 Hours.**

Application of statistical techniques including use of lognormal distribution for environmental and occupational health exposure assessment problems. Spatial and temporal correlations are discussed and appropriate analysis techniques are described for these situations using statistical software packages.

**BST 608. Statistical Modeling in Clinical and Epi Studies. 3 Hours.**

Provide an understanding of modeling approaches to address the challenges of “real life” data sets in the framework of linear models as they relate to clinical and epidemiological studies.

**Prerequisites:** BST 602 [Min Grade: C] and BST 612 [Min Grade: C]

**BST 611. Intermediate Statistical Analysis I. 3 Hours.**

Students will gain a thorough understanding of basic analysis methods, elementary concepts, statistical models and applications of probability, commonly used sampling distributions, parametric and non-parametric one and two sample tests, confidence intervals, applications of analysis of two-way contingency table data, simple linear regression, and simple analysis of variance. Students are taught to conduct the relevant analysis using current software such as the Statistical Analysis System (SAS).

**BST 611Q. Intermediate Statistical Analysis I Online. 3 Hours.**

This course will utilize current statistical techniques to assess and analyze public health related data. In addition, students will learn to read and critique the use of such techniques in published research. Students will also determine what analytical approaches are appropriate under different research scenarios.
BST 612. Intermediate Statistical Analysis II. 3 Hours.
This course will introduce students to the basic principles of tools of simple and multiple regression. A major goal is to establish a firm foundation in the discipline upon which the applications of statistical and epidemiologic inference will be built. If prerequisite is not met, permission of instructor is required.
Prerequisites: BST 611 [Min Grade: C] or BST 611Q [Min Grade: C]

BST 612Q. Intermediate Statistical Analysis II Online. 3 Hours.
This course will utilize current statistical techniques to assess and analyze public health related data. In addition, students will learn to read and critique the use of such techniques in published research. Students will also determine what analytical approaches are appropriate under different research scenarios.
Prerequisites: BST 611 [Min Grade: C] or BST 611Q [Min Grade: C]

BST 613. Intermediate Statistical Analysis III. 3 Hours.
This course will introduce students to additional general concepts in biostatistics beyond an introductory level to include study design, power and sample size estimation, mixed-models, survival analysis, survey design and interpretation of research results. Prerequisites: BST 601 or 611 or 612, or prior statistics/biostatistics course that included hypothesis testing for proportions and means, ANOVA, correlation, simple and multiple linear regression, and logistic regression (with approval of the instructor).
Prerequisites: (BST 601 [Min Grade: C] or BST 601Q [Min Grade: C] or BST 611 [Min Grade: C] or BST 611Q [Min Grade: C]) and (BST 612 [Min Grade: C] or BST 612Q [Min Grade: C])

BST 619. Data Collection and Management. 3 Hours.
Basic concepts of study design, forms design, quality control, data entry, data management and data analysis. Hands-on experience with data entry systems, e.g., DBASE, and data analysis software, e.g., PC-SAS. Exposure to other software packages as time permits. Previous computer experience or workshop on microcomputers highly recommended. NOTE: If space permits, non-degree graduate students will be permitted to enroll. All students registered for the course must attend 1st class to remain enrolled. Previous computer experience or workshop on microcomputers highly recommended.
Prerequisites: BST 601 [Min Grade: C] or BST 601Q [Min Grade: C] or BST 611 [Min Grade: C] or BST 611Q [Min Grade: C] or BST 621 [Min Grade: C]

BST 620. Applied Matrix Analysis. 3 Hours.
Vector and matrix definitions and fundamental concepts; matrix factorization and application. Eigen-values and eigen-vectors, functions of matrices, singular and ill-conditioned problems.
Prerequisites: BST 622 [Min Grade: C]

BST 621. Statistical Methods I. 3 Hours.
Mathematically rigorous coverage of applications of statistical techniques designed for Biostatistics majors and others with sufficient mathematical background. Statistical models and applications of probability; commonly used sampling distributions; parametric and nonparametric one and two sample tests and confidence intervals; analysis of two-way contingency table data; simple linear regression; simple analysis of variance designs with equal or proportional subclass members; use of contrasts and multiple comparisons procedures; introduction to survival analysis; multivariate methods. Interested students must have a year of calculus sequence before enrolling in BST 621.

BST 622. Statistical Methods II. 3 Hours.
Mathematically rigorous coverage of applications of statistical techniques designed for Biostatistics majors and others with sufficient mathematical background. Statistical models and applications of probability; commonly used sampling distributions; parametric and nonparametric one and two sample tests and confidence intervals; analysis of contingency tables; simple linear regression; simple analysis of variance designs with equal or proportional subclass members; use of contrasts and multiple comparisons procedures; introduction to survival analysis; multivariate methods. Prerequisites: Biostatistics 621; permission of instructor.
Prerequisites: BST 621 [Min Grade: C] (Can be taken Concurrently)

BST 623. General Linear Models. 3 Hours.
Simple and multiple regression using matrix approach; weighted and non-linear regression; variable selection methods; modeling techniques; regression diagnostics and model validation; systems of linear equations; factorial designs; blocking; an introduction to repeated measures designs; Coding schemes.
Prerequisites: BST 622 [Min Grade: C]

BST 624. Experimental Design. 3 Hours.
Intermediate experimental design and analysis of variance models using matrix approach. Factorial and nested (hierarchical) designs; blocking; repeated measures designs; Latin squares; incomplete block designs; fractional factorials; confounding. Students should have had matrix algebra as a prerequisite.
Prerequisites: BST 623 [Min Grade: C]

BST 625. Design/Conduct Clinical Trials. 3 Hours.
Concepts of clinical trials; purpose, design, implementation and evaluation. Examples and controversies presented.
Prerequisites: BST 611 [Min Grade: C] and BST 612 [Min Grade: C] or BST 621 [Min Grade: C] and BST 622 [Min Grade: C]

BST 626. Data Management and Reporting with SAS. 3 Hours.
A hands-on exposure to data management and report generation with one of the most popular statistical software packages. Concurrent registration in BST 626L is required. Note: Non-degree graduate students will be allowed to register if space permits.

BST 626L. Data Management and Reporting with SAS Laboratory. 0 Hours.
A hands-on exposure to data management and report generation with one of the most popular statistical software packages.

BST 626Q. Data Management and Reporting with SAS. 3 Hours.
This course is designed to provide an introduction to data management and reporting using the SAS system. Students who have some PC computer experience or who have been introduced to SAS are eligible to take this course. Any student taking this course should be familiar with simple summary statistics such as the mean, standard deviation, standard error, median and percentiles as well as proportions. Outside of familiarity with these basic statistics, no other statistical background is required. Though not required, some programming background will be useful as this assures the instructor that the student is familiar with the logic critical in understanding conditional execution commonly used in SAS.

BST 630. Estimation & Inference. 3 Hours.
This course is an introduction to probability concepts and statistical inference. Topics include counting techniques, discrete and continuous univariate and multivariate random variables & common distributions, probability, expectation, variance, confidence intervals, the Central Limit Theorem, and hypothesis testing.
BST 631. Statistical Theory I. 4 Hours.
Fundamentals of probability; independence; distribution and density functions; random variables; moments and moment generating functions; discrete and continuous distributions; exponential families, marginal and conditional distributions; transformation and change of variables; convergence concepts, sampling distributions. Point and interval estimation; hypothesis and significance testing; sufficiency and completeness; ancillary statistics; maximum likelihood and moment estimators; asymptotic properties of estimators and tests; introduction to Bayesian inference. Prerequisites: Proficiency in Algebra and calculus is required.

BST 632. Statistical Theory II. 4 Hours.
Fundamentals of probability; independence; distribution and density functions; random variables; moments and moment generating functions; discrete and continuous distributions; exponential families, marginal and conditional distributions; transformation and change of variables; convergence concepts, sampling distributions. Point interval estimation; hypothesis and significance testing; sufficiency and completeness; ancillary statistics; maximum likelihood and moment estimators; asymptotic properties of estimators and tests; introduction to Bayesian inference. Prerequisites: BST 631 [Min Grade: C]

BST 640. Nonparametric Methods. 3 Hours.
Properties of statistical tests; order statistics and theory of extremes; median tests; goodness of fit; tests based on ranks; location and scale parameter estimation; confidence intervals; association analysis; power and efficiency. Prerequisites: BST 621 [Min Grade: C] and BST 631 [Min Grade: C]

BST 655. Categorical Data Analysis. 3 Hours.
Logistic regression models; regression diagnostics; proportional odds; ordinal and polytomous logistic regression; analyses for multi-way tables; Mantel-Haenszel test; measures of association and of agreement; loglinear and logit models; ordinal discrete data; matched pairs; repeated categorical data. BST 612 or equivalent recommended as a prerequisite. Prerequisites: BST 622 [Min Grade: C]

BST 660. Applied Multivariate Analysis. 3 Hours.
Analysis and interpretation of multivariate general linear models including multivariate regression, multivariate analysis of variance/covariance, discriminant analysis, multivariate analysis of repeated measures, canonical correlation, and longitudinal data analysis for general and generalized linear models. Extensive use of SAS, SPSS, and other statistical software. Prerequisites: BST 623 [Min Grade: C]

BST 661. Structural Equation Modelling. 3 Hours.
Basic principles of measurements; factor analysis and latent variable models; multivariate predictive models including mediation mechanisms and moderators effects; path analysis; integrative multivariate covariance models, methods of longitudinal analysis. Prerequisites: BST 623 [Min Grade: C]

BST 665. Survival Analysis. 3 Hours.
Design and analysis of clinical trials; sample size computation; properties of survival distributions; estimation and hypothesis testing for survival parameters; Kaplan-Meier estimation; exponential tests; Cox proportional hazards regression models, parametric survival models. Prerequisites: BST 622 [Min Grade: C]

BST 670. Sampling Methods. 3 Hours.
Simple random, stratified, cluster, ratio regression and systematic sampling; sampling with equal or unequal probabilities of selection; optimization; properties of estimators; non-sampling errors; sampling schemes used in population research; methods of implementation and analyses associated with various schemes. Prerequisites: BST 631 [Min Grade: C]

BST 671. Meta-Analysis. 3 Hours.
Statistical methods and inference through meta analysis. Prerequisites: BST 623 [Min Grade: C] and BST 632 [Min Grade: C]

BST 675. Introduction to Statistical Genetics. 3 Hours.
This class will introduce students to population genetics, genetic epidemiology, microarray and proteomics analysis, Mendelian laws, inheritance, heritability, test cross linkage analysis, QTL analysis, human linkage and human association methods for discrete and qualitative traits. Prerequisites: BST 611 [Min Grade: C] or BST 621 [Min Grade: C]

BST 676. Genomic Data Analysis. 3 Hours.
Algorithms and methods that underlie the analysis of high dimensional biological data, as well as issues in the design and implementation of such studies. High dimensional biology includes microarrays, proteomics, genomic, protein structure, biochemical system theory and phylogenetic methods. NOTE: Some knowledge of statistics (MTH 180 or BST 621) also some bioinformatics/high dimensional biology training (CS 640, MIC 753, or BST 675 is required. Interested students are urged to contact the instructors with concerns regarding assumed knowledge. Prerequisites: BST 611 [Min Grade: C] or BST 621 [Min Grade: C]

BST 680. Statistical Computing with R. 3 Hours.
This course is mainly focused on R and how to use R to conduct basic statistical computing. The course contains three themes: R programming, introduction to high performance computing, and basics of statistical computing. Prerequisites: BST 621 [Min Grade: C] and BST 622 [Min Grade: C] and BST 626 [Min Grade: C]

BST 690. Biostatistical Consulting and Applied Problems. 3 Hours.
Students will work individually to address, analyze and present the results of an applied problem or grant design each week. The presentation of approaches, solutions and designs will be conducted in a round table format. Students will be evaluated on the quality of solution and by their presentation and class participation. Prerequisites: BST 621 [Min Grade: C] and BST 622 [Min Grade: C]

BST 691. Pre-Doctoral Seminar Series. 1 Hour.
Biostatistics Seminar Series. This course is restricted to Biostatistics in Public Health majors only.

BST 695. Special Topics. 1-3 Hour.
Special topics in Biostatistics not covered in regular 600 level courses, but suited for Masters students in Biostatistics and doctoral students in other related disciplines.
BST 697. Internship in Biostatistics. 3 Hours.
The internship provides an opportunity for each student to work in a public health setting in a position that carries responsibility and is of particular interest. BST 697 is a 3-credit hour course requirement of all MPH-seeking students. In order to register for the internship course, students must have completed all public health core coursework. Usually, this means that students must wait until their 3rd semester to complete the internship. Students must complete a minimum of 180 contact hours with the organization during the semester in which they register for the internship.

Prerequisites: (BST 601 [Min Grade: C] or BST 601Q [Min Grade: C] or BST 611 [Min Grade: C] or BST 611Q [Min Grade: C]) and (BST 612 [Min Grade: C] or BST 612Q [Min Grade: C]) and (ENH 600 [Min Grade: C] or ENH 600Q [Min Grade: C] or ENH 611 [Min Grade: C] or ENH 611Q [Min Grade: C]) and (EPI 600 [Min Grade: C] or EPI 600Q [Min Grade: C] or EPI 610Q [Min Grade: C]) and (HB 600 [Min Grade: C]) and (HB 600Q [Min Grade: C]) and (HCO 600 [Min Grade: C]) and (HCO 600Q [Min Grade: C])

BST 698. Non Thesis Research. 1-12 Hour.
Independent non-thesis research with guidance of appropriate faculty. Restricted to Biostatistics Majors only or permission of instructor / department.

BST 699. Thesis Research. 1-12 Hour.
Thesis Research under the direction of research committee. At least 6 graduate credits needed for graduation. Must be admitted to candidacy.

Prerequisites: GAC M

BST 723. Theory of Linear Models. 3 Hours.
Multivariate normal distributions and quadratic forms; least square estimation; nested models; weighted least squares; testing contrasts; multiple comparison; polynomial regression; maximum likelihood theory of log linear models will be studied.

Prerequisites: BST 632 [Min Grade: C]

BST 725. Advances Clinical Trials. 3 Hours.
This course will provide students with the tools to develop a basic understanding of the fundamental statistical principles involved in the design and conduct of clinical trials.

Prerequisites: BST 611 [Min Grade: C] and BST 612 [Min Grade: C] or BST 621 [Min Grade: C] and BST 622 [Min Grade: C] and BST 625 [Min Grade: C]

BST 726. Advanced Clinical Trials II. 1 Hour.
This course builds on the knowledge gained in BST 725 in order to develop a more thorough understanding of the basic methodology behind important statistical concepts used in the design and analysis of large, randomized clinical trials. The class will involve discussions of publications dealing with current topics of interest in clinical trials.

Prerequisites: BST 621 [Min Grade: C] and BST 622 [Min Grade: C] and BST 625 [Min Grade: C] and BST 631 [Min Grade: C] and BST 632 [Min Grade: C] and BST 725 [Min Grade: C]

BST 735. Advanced Inference. 4 Hours.
Families of models; likelihood; sufficiency; significance tests; similar regions; point and interval estimation; invariant tests; asymptotic theory and large sample inference; LR, score and Wald tests; robust procedures will be studied.

Prerequisites: BST 632 [Min Grade: C] and BST 631 [Min Grade: C]

BST 740. Bayesian Analysis. 3 Hours.
To introduce the student to the basic principles and tools of Bayesian Statistics and most importantly to Bayesian data analysis techniques. A major goal is to establish a firm foundation in the discipline upon which the applications of statistical and epidemiologic inference will be built.

Prerequisites: BST 632 [Min Grade: C]

BST 741. Advanced Bayesian Analysis II. 3 Hours.
This course is intended to illustrate advanced Bayesian modeling and computation for variety of models and problems.

Prerequisites: BST 622 [Min Grade: C] and BST 632 [Min Grade: C]

BST 750. Stochastic Modeling. 3 Hours.
Poisson processes; random diffusion and branching processes; recurrent events; Markov chains in discrete and continuous time; birth and death process; queuing systems; applications to survival and other biomedical models will be studied.

Prerequisites: BST 632 [Min Grade: C]

BST 760. Generalized Linear and Mixed Models. 3 Hours.
Generalized linear models; mixed models; and generalized estimating equations.

Prerequisites: BST 723 [Min Grade: C]

BST 775. Statistical Methods for Genetic Analysis I. 3 Hours.
This course will provide a statistical basis for describing variation in qualitative (disease) and quantitative traits. This will include decomposition of trait variation into components representing genes, environment and gene-environment interaction. Resemblance between relative and heritability will be described. Important topics of discussion will include oligogenic and polygenic traits, complex segregations analysis, methods of mapping and characterizing simple and complex trait loci. NOTE: It is assumed that students are comfortable with regression theory, covariance, correlation, and likelihood theory. Interested students are urged to contact the instructors with concerns regarding assumed knowledge.

Prerequisites: BST 623 [Min Grade: C] and BST 632 [Min Grade: C] and BST 675 [Min Grade: C]

BST 776. Statistical Methods for Genetic Analysis II. 3 Hours.
This course builds on the knowledge gained in BST 775 with rigorous mathematical & statistical treatment of methods for localizing genes and environmental effects involved in the etiology of complex traits using case-control and pedigree data. NOTE: Knowledge of SAS and programming languages such as C++, and basic knowledge of multivariate methods and Markov chain theory is highly recommended.

Prerequisites: BST 775 [Min Grade: C]

BST 793. Post-doc Seminar Series. 3 Hours.
BST seminar series. Permission of instructor / department required.

BST 795. Advanced Special Topics. 1-3 Hour.
This course is designed to cover advanced special topics in Biostatistics that are not covered in regular 700 level courses, but suited for doctoral students in Biostatistics.

Prerequisites: BST 622 [Min Grade: C] and BST 632 [Min Grade: C]
**BST 798. Non-Dissertation Research. 1-12 Hour.**
Non-dissertation research with the guidance of appropriate faculty. Research conducted before admission to candidacy for the doctoral degree. Biostatistics majors only or permission of instructor / department required.

**BST 799. Dissertation Research. 1-12 Hour.**
Doctoral Level Dissertation Research under the direction of the dissertation research committee. Reserved for Biostatistics only or permission of instructor / department. Admission to Candidacy required.

**Prerequisites:** GAC Z