BIOSTATISTICS, BIOINFORMATICS, AND SYSTEMS BIOLOGY (GS01)

Course descriptions in school catalogs and the Course Search (https://catalog.uth.edu/course-search/)are correct at the time of publication. See myUTH (https://uthidp.uth.edu/nidp/saml2/sso/?id=Campus-Affiliate-LOA2-DUO&sid=0&option=credential&sid=0) for more recent course information and to register for courses.

GS01 1022 Statistical Communication, Consulting and Collaborative Data Science (2 Credits)
Prerequisites: Students are expected to have knowledge in basic Statistics Inference, Probability, and Linear Regression. Prior programming experience in R or Python is required. Consent of Instructor is also required. This course is designed to help students build essential statistical communication skills that are often underemphasized in traditional training. It focuses on preparing students to collaborate effectively with researchers from diverse backgrounds by teaching them how to: effectively interview collaborators to understand their research questions and objectives, articulate mutual goals and expectations specific to statistical consulting and interdisciplinary collaboration, define statistical objectives and deliverables that can guide the research process, and provide regular progress updates in a clear and actionable manner. Through two core components¿a consulting clinic and a project-based learning curriculum¿students gain hands-on experience in applying statistical and data science knowledge while refining their communication and collaboration skills. In the consulting clinic, students offer pro bono statistical consulting services to UTHealth/MDA community researchers, working under instructor supervision to apply these skills in real-world settings. The project-based learning component focuses on project scoping, collaborative practices, and reproducible workflows, equipping students with tools to translate research questions into actionable solutions and foster productive interdisciplinary collaborations. This course will prepare students for professional collaborations in academic and industry settings. Note: Students who are interested in the course but not sure whether they meet the prerequisites can contact the course directors. If the registration number goes above 12, the course directors will make decisions on who to admit to the course. Priorities will be given to QS program 1st and 2nd year PhD students and those who meet the prerequisites. The directors will provide guidance on preparing the prerequisites, through taking other basic statistical courses in class or through Coursera courses, for those who are interested in taking it in future. Letter Graded

GS01 1023 Survival Analysis (3 Credits)
Prerequisite: Introduction to Biostatistics and Clinical Trials (GS01 1033), or permission of instructor. Survival data are commonly encountered in scientific investigations, especially in clinical trials and epidemiologic studies. In this course, commonly used statistical methods for the analysis of failure-time data will be discussed. One of the primary topics is the estimation of survival function based on censored data, which include parametric failure-time models, and nonparametric Kaplan-Meier estimates of the survival distribution. Estimation of the cumulative hazard function and the context of hypothesis testing for survival data will be covered. These tests include the log rank test, generalized log-rank tests, and some non-ranked based test statistics. Regression analysis for censored survival data is the most applicable to clinical trials and applied work. The Cox proportional hazard mode, additive risk model, other alternative modeling techniques, and new theoretical and methodological advances in survival analysis will be discussed. Letter Graded

GS01 1031 Quantitative Sciences Student Seminar Series (1 Credit)
Prerequisite: Permission of instructor; general genetics and statistics recommended. This series is held bi-weekly for students to present their research project in front of their peers and program faculty. The focus of the session is for the students to practice presenting their project to a varied audience of peers and mentors. Attendees should be prepared to ask questions of the speaker and to provide constructive criticism. This is a required course for all QS Program students and participation is mandatory. All QS students must register for this course every semester unless the student has a direct course conflict. QS-affiliated students are expected to give a minimum of two talks; one pre-candidacy and one post-candidacy, and secondary ARC students are expected to give a minimum of one talk. Pass/Fail

GS01 1033 Introduction to Biostatistics and Clinical Trials (3 Credits)
Prerequisite: Calculus and linear algebra. This course is a one-semester overview of statistical concepts most often used in the design and analysis of biomedical studies. It provides an introduction to the analysis of biomedical and epidemiological data. The focus is on non-model-based solutions to one sample and two sample problems. The course also includes an overview of statistical genetics and bioinformatics concepts. Because this course is primarily for statistics majors, the applied methods will be related to theory wherever practical. Students will be given the opportunity to gain experience in the general approach to data analysis and in the application of appropriate statistical methods. Emphasis will be on the similarity between various forms of analysis and reporting results in terms of measures of effect or association. Emphasis will also be given to identifying statistical assumptions and performing analyses to verify these assumptions. Because effective communication is essential to effective collaboration, students will have the opportunity to gain experience in presenting results for statistically naive readers. Letter Graded

GS01 1143 Introduction to Bioinformatics (3 Credits)
Prerequisite: None. This course is intended to be an introduction to concepts and methods in bioinformatics with a focus on analyzing data merging from high throughput experimental pipelines such as next-gen sequencing. Students will be exposed to algorithms and software tools involved in various aspects of data processing and biological interpretation. Though some prior programming experience is highly recommended, it is not a requirement. Letter Graded

GS01 1233 GLM & Categorical Data Analysis (3 Credits)
Prerequisite: STAT 519, STAT 615, or STAT 410 (Rice courses) or permission of instructor. This course is devoted to the theory and methodology of categorical data analysis with an introduction to Generalized Linear Models. There will be analyses of real data sets using R. The course is cross-listed at Rice University (STAT 545). The venue of the course will be at Rice University. Letter Graded

GS01 1273 Modern Nonparametrics (3 Credits)
Prerequisites: Mathematical Statistics (GS01 1083 or equivalent) and Linear Regression or permission of instructor. This course seeks to introduce students to the many developments in modern nonparametrics, including resampling methods, nonparametric and semiparametric regression models that have occurred over the last several decades. Topics include the bootstrap, jackknife, cross-validation, permutation tests, classification tree, random forests, nonparametric smoothing and regression, spline regression, and functional data analysis. While the course will focus on applications, time will be devoted to derivations and theoretical justifications of methods. The statistical software R will be used for the homework exercises. Letter Graded

GS01 1283 Foundations of Statistical Inference II (3 Credits)
Prerequisite: Rice STAT 532. This is the second semester course in a two-semester sequence in mathematical statistics. The course topics include random variables, distributions, small and large sample theorems of decision theory and Bayesian methods, hypothesis testing, point estimation, and confidence intervals; topics such as exponential families, univariate and multivariate linear models, and nonparametric inference will also be discussed. This course is cross-listed at Rice (STAT 533). The venue of the course will be at Rice University. Letter Graded

GS01 1813 Topics in Clinical Trials (3 Credits)
Prerequisites: Prior courses in probability and statistics, Consent of instructor. This course will provide an overview of methods for the design and analysis of clinical trials. Topics will include fundamental principles and commonly used designs for phases I, II and III trials. Advanced topics will include flaws with many conventional methods, hybrid designs, dealing with multiple outcomes, bias correction, precision medicine, and Bayesian methods. This course is cross-listed at Rice University as STAT 630. Letter Graded