

Summer 2020 Course Offerings

Undergraduate Stat Courses	Course Title	Instructors	Prerequisite	Course explorer Description	Instructor Description
STAT 100	Statistics	K. Flanagan	Math 112	First course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models.	Stat 100 is a first course in statistics and probability at a precalculus level designed for non-STEM related majors. This course emphasizes basic concepts, including experimental design, descriptive statistics, elementary probability, 2 variable data, sampling and estimating, and hypothesis testing.
STAT 200	Statistical Analysis	E. Fireman	One year of calculus experience	Survey of statistical concepts, data analysis, designed and observational studies and statistical models. Statistical computing using a statistical package such as R or a spreadsheet. Topics to be covered include data summary and visualization, study design, elementary probability, categorical data, comparative experiments, multiple linear regression, analysis of variance, statistical inferences and model diagnostics. May be taken as a first statistics course for quantitatively oriented students, or as a second course to follow a basic concepts course.	Most people think statistics is boring and difficult. Statistics is to data what grammar is to words. And like grammar, it's only interesting if it's used to understand something interesting. In Stat 200, we use statistics to research a topic we're all interested in - ourselves. We collect data on ourselves through anonymous surveys, largely on the sort of social questions on which students have shown intense interest. Having real questions that we want to answer motivates real understanding, not just memorizing some complicated rules. Statistics is a collection of real tools- the key is to understand which one to use when and why.
STAT 400	Statistics and Probability I	A. Stepanov	Math 241	Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-term introduction to statistics and also prepares students for STAT 410.	
STAT 410	Statistics and Probability II	A. Stepanov	Stat 410	Continuation of STAT 400. Includes moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests.	
STAT 420	Methods of Applied Statistics	D. Unger	Stat 400	Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used.	This is a bridge course to guide budding statisticians and data scientists with a basic knowledge of statistical practices into a more advanced set of methods. It will provide a foundation to many advanced electives that our department offers, and it includes topics such as Applied Linear Regression, Analysis of Variance, Categorical Data Analysis, and Statistical Computing. Students will gain a variety of skills in statistical programming as well as simulation methods. Extensive use of R and RMarkdown are employed by the course to provide technical skills as well.
STAT 440	Statistical Data Management	C. Kinson	Stat 400 or Stat 409	The critical elements of data storage, data cleaning, and data extractions that ultimately lead to data analysis are presented. Includes basic theory and methods of databases, auditing and querying databases, as well as data management and data preparation using standard large-scale statistical software. Students will gain competency in the skills required in storing, cleaning, and managing data, all of which are required prior to data analysis.	I believe this course is a good course for students who have very little knowledge about data wrangling. It could serve as a nice precursor for a data analysis course such as STAT 448, because at least 50% of data analysis involves data wrangling. The topics in STAT 440 will be important data wrangling concepts such as accessing and importing data and transforming it to fit a prescribed data analysis. This course will feel a lot like a how-to course with some rationales as to why doing those things is important. No data wrangling will make sense without first establishing the questions we have for the particular dataset in front of us. We will likely use R notebooks as our reproducible documentation and explore the R's loop structures, vectorization, the tidyverse, and other SQL-inspired data wrangling tools. Also, we will also look at several data types including traditional structured data (tables, data frames, matrices, time series), semi-structured data (JSON), and unstructured data (text). This course won't get into any statistical analysis; rather we will do the work it takes to prepare data for statistical analysis. The course might also spend time improving how to display or visualize the wrangled data.
STAT 448	Advanced Data Analysis	L. Bravo	Stat 400 or Stat 409; credit or concurrent enrollment with Stat 410	Several of the most widely used techniques of data analysis are discussed with an emphasis on statistical computing. Topics include linear regression, analysis of variance, generalized linear models, and analysis of categorical data. In addition, an introduction to data mining is provided considering classification, model building, decision trees, and cluster analysis.	The use of an appropriate data analysis technique requires knowledge about a wide spectrum of sound statistical methods. The purpose of this class is to introduce the student to the main statistical inference techniques and modelling approaches for several types of data variables, including categorical data, experimental design and multivariate data. The topics in the course include applications of descriptive statistics and visualization, hypothesis tests for population locations and distributional goodness of fit tests, basic introduction to categorical data analysis, ANOVA (balanced and unbalanced), simple and multiple linear regression, logistic regression, generalized linear models, PCA, hierarchical cluster analysis, and discriminant analysis (LDA and QDA). The class setting uses a computational environment for the use of statistical packages.