

## Undergraduate Statistics Courses

**STAT 2300. Introduction to Applied Statistics Using Technology. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Introduction to data types, sampling and bias, graphs, descriptive statistics, linear regression, correlation, probability, random variables of discrete type, binomial Poisson and geometric distributions, continuous random variables and the normal distribution, sampling distributions and the central limit theorem. Statistical software such as R, Python, or SAS are integrated throughout the course. Prerequisite: corequisite: MATH 2413.

**STAT 2301. Intermediate Statistical Methods using Technology. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Descriptive statistics, estimation using confidence intervals, hypothesis tests of one population parameter, two population comparisons, ANOVA completely randomized design, ANOVA completely randomized block design. Statistical software such as R, Python, or SAS are integrated throughout the course. Prerequisite: STAT 2300.

**STAT 3311. Probability & Statistics I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Topics will include probability axioms and properties; conditional probability and independence; counting techniques; and discrete, continuous, univariate, and multivariate random variables. Prerequisite: MATH 2414.

**STAT 3312. Probability & Statistics II. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Topics will include normal distributions; sampling distributions; the central limit theorem; descriptive statistics; and the theory of statistical estimation and testing, with applications to proportions, means, contingency tables, univariate linear regression, and analysis of variance. Prerequisite: MATH 3311 or STAT 3311.

**STAT 3364. Data Analysis I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Mathematical foundations of data analysis techniques. Applications of Lagrangians to support vector machines, gradient descent methods for artificial neural networks, and conditional probabilities for Bayesian classifiers. Additional topics will be selected from: the class imbalance problem, cost sensitive learning, bootstrapping, kernel methods, impurity measures, distance metrics, topological data analysis, anomaly detection and convergence theorems for various methods. Prerequisites: MATH 2318, MATH 3433, COSC 1310, and one course from MATH 1342, STAT 2301, STAT 3312, or MATH 3450.

**STAT 4086. Statistics Problems. 1-4 Credit Hours (Lecture: 0 Hours, Lab: 1-4 Hours).**

Special problems in statistics. Not covered by any course in the curriculum. Work may be either theory or laboratory. May be repeated with approval of the department head for additional credit. Prerequisite: Approval of department head.

**STAT 4098. Undergraduate Research Project. 1-3 Credit Hours (Lecture: 0 Hours, Lab: 1-3 Hours).**

Methods of research in statistics through a research project directed by a departmental faculty member. The student is required to prepare a final report and presentation. No credit is earned until the student has enrolled in at least 3 credit hours and the final report and presentation are certified as completed by the faculty member directing the project, at which time the student will receive 3 credit hours. Prerequisite: Approval of department head.

**STAT 4300. Linear Models. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Development of the matrix theory needed to formulate, analyze, and verify model assumptions of linear models. Parameter estimation and hypothesis testing for linear models utilizing least squares. Applying linear models to real world problems. Prerequisites: MATH 2318, STAT 3312, and STAT 2301.

**STAT 4301. Design of Experiments. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours). [WI (<http://catalog.tarleton.edu/academicaffairs/>)]**

Introduction to model design. Topics can be chosen from, but are not limited to, ANOVA completely randomized design, ANOVA completely randomized block design, fixed and random effects, factorial designs, analysis of covariance, or categorical data analysis. Prerequisite: STAT 4300.

**STAT 4302. Nonparametric Statistics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Introduction to nonparametric statistics. Topics will include hypothesis testing, contingency tables, rank tests, and goodness-of-fit tests Prerequisite: STAT 2301, STAT 3312.

**STAT 4310. Bayesian Analysis. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Introduction to Bayesian analysis, including comparisons of Bayesian and frequentist techniques. Topics will include prior and posterior distributions, Bayesian updating, and implementation of Markov Chain Monte Carlo and Gibbs sampling. Prerequisite: STAT 2301, STAT 3312.

**STAT 4320. Time Series Analysis. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Statistical analysis of time series data in the time and frequency domains. Topics will include auto-regressive, moving average, and ARIMA models, the autocovariance and partial autocovariance functions, and spectral analysis. Prerequisite: STAT 2301, STAT 3312.

**STAT 4364. Data Analysis II. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Advanced statistical analysis using supervised and unsupervised machine learning and appropriate software packages such as R, Python, SAS, or SQL. Large data sets are utilized extensively. Prerequisite: MATH 3364 or STAT 3364.

**STAT 4384. Internship. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

The student will complete a supervised and comprehensive work experience in a statistics-related position with a public or private business organization for career preparation in a statistics-related enterprise. The work experience must be formally approved and arranged with a cooperating sponsor prior to semester of enrollment in the course, and should be completed within the semester of course enrollment. Oral and written reports of the internship experience will be required. Prerequisite: Approval of department head.

**STAT 4390. Statistics Topics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).**

Topics will be selected from areas of statistics suitable for upper level study. This course may be repeated once, with department head approval, as topics change. Prerequisite: Approval of department head.