

# STATISTICS (STAT)

## STAT 1. Introduction to Statistics. 3 Units

**Prerequisite(s):** Math 10 or a score of 51 or higher on a proctored ALEKS PPL exam.

**General Education Area/Graduation Requirement:** Mathematical Concepts & Quantitative Reasoning (2-A)

**Term Typically Offered:** Fall, Spring

Descriptive statistics, basic concepts of probability and sampling with the aim of introducing fundamental notions and techniques of statistical inference.

## STAT 10A. Introductory Statistics with Developmental Mathematics. 3 Units

**Term Typically Offered:** Fall, Spring, Summer

Prepares students for STAT 10B that requires background in data analysis process, descriptive statistics and the concept of randomness.

Topics include: Summarizing the data distribution graphically and numerically; reasoning about bivariate numerical data; linear correlation and regression; linear, quadratic and exponential functions as a way of modeling a correspondence between two variables; reasoning about bivariate categorical data; basic concepts of probability and the law of large numbers; conditional probability; discrete random variables; binomial distribution; and an introduction to continuous random variables. Lecture three hours.

## STAT 10B. Introductory Statistics with Developmental Mathematics. 3 Units

**Prerequisite(s):** STAT 10A

**General Education Area/Graduation Requirement:** Mathematical Concepts & Quantitative Reasoning (2-A)

**Term Typically Offered:** Spring only

Continuation of STAT 10A. Stat 10B prepares students for research methods applications/ courses in various disciplines. Topics include: Continuous random variables and normal distribution; sampling distributions and the central limit theorem; confidence intervals and tests of hypotheses for means, proportions, difference in means and difference in proportions; and chi-squared tests for categorical data analysis. Lecture three hours.

## STAT 50. Introduction to Probability and Statistics. 4 Units

**Prerequisite(s):** MATH 26A, MATH 30, or appropriate high school based AP credit.

**General Education Area/Graduation Requirement:** Mathematical Concepts & Quantitative Reasoning (2-A)

**Term Typically Offered:** Fall, Spring, Summer

Sample spaces, combinatorics, and random variables. Density and distribution functions. Expectation, variance, and covariance. The binomial, uniform, poisson, negative binomial, hypergeometric, exponential, gamma, beta, and normal distributions. Sampling distributions, estimation, and hypothesis tests. Students are given periodic writing assignments which encourage them to think through concepts of the course.

## STAT 96. Experimental Offerings in Statistics. 1 - 6 Units

**Term Typically Offered:** Fall, Spring

When there is a demand from a sufficient number of qualified students, one of the staff will conduct a seminar on some topic in statistics.

## STAT 103. Intermediate Statistics. 3 Units

**Prerequisite(s):** STAT 50 or instructor consent

**Term Typically Offered:** Spring only – even years

Review of hypothesis testing –one sample. Hypothesis testing –two sample, variance. Regression and correlation. Analysis of variance including two-way. Analysis of categorical data. Non-parametric tests, goodness of fit, and tests for randomness.

## STAT 115A. Introduction to Probability Theory. 3 Units

**Prerequisite(s):** MATH 31 and either STAT 1 or STAT 50

**Term Typically Offered:** Fall only

Probability axioms, discrete and continuous random variables, functions of random variables, joint densities, expectation, moment generating functions. Chebyshev's inequality, transformations, weak law of large numbers, central limit theorem.

## STAT 115B. Introduction to Mathematical Statistics. 3 Units

**Prerequisite(s):** STAT 115A.

**Term Typically Offered:** Spring only

Point Estimation, interval estimation, hypothesis testing, the multivariate normal distribution, non-parametric tests.

## STAT 128. Statistical Computing. 3 Units

**Prerequisite(s):** (STAT 1 or STAT 50) and (MATH 26A or MATH 30) or consent of the instructor.

Computer methods for accessing, transforming, summarizing, graphing and making statistical inferences from data; focus is on command-line statistical software, but menu-driven software may be introduced; application of computer methods to solve problems selected from the areas of modeling, simulation, inference and statistical learning.

## STAT 129. Analyzing and Processing Big Data. 3 Units

**Prerequisite(s):** (STAT 1 or STAT 50) and (MATH 26A or MATH 30) and (STAT 128 or CSC 20), or consent of the instructor.

**Term Typically Offered:** Fall, Spring

Statistical analysis of large, complex data sets. Topics include memory efficient data processing, the split-apply-combine strategy, rewriting programs for scalability, handling complex data formats, and applications such as statistical learning, dimension reduction, and efficient data representation. Students will access data and run code on remote servers.

## STAT 140A. Linear Models. 3 Units

**Prerequisite(s):** Stat 115A and Stat 128 and (Math 35 or Math 100)

**Term Typically Offered:** Fall only

Practical statistical modeling of data using professional-grade statistical software. Simple and multiple linear regression, analysis of variance, logistic regression, variable transformation, variable selection, model selection, residual analysis.

## STAT 140B. Statistical Learning. 3 Units

**Prerequisite(s):** Stat 140A

**Term Typically Offered:** Spring only

Practical statistical modeling of data using professional-grade software. Principles, methodologies, and applications of supervised techniques such as classification, resampling, model selection, nonlinear regression, and tree-based methods. Unsupervised techniques including clustering and dimension reduction.

**STAT 141. Introduction to Data Science. 3 Units**

**Prerequisite(s):** One of (Stat 1, Stat 10B, Stat 50, Psyc 9, Soc 101, Swrk 110, Engr 115). Other courses may be accepted based on instructor discretion.

**General Education Area/Graduation Requirement:** Mathematical Concepts & Quantitative Reasoning (2-A)

**Term Typically Offered:** Fall only

Exploratory data analysis, data visualization, summarization, inference, modeling, and effective communication of results. Focus on professional data science software, real world data sets, and relevant questions.

**STAT 155. Introduction to Techniques of Operations Research. 3 Units**

**Prerequisite(s):** MATH 31; STAT 50, STAT 103, or STAT 115A; MATH 31 may be taken concurrently.

**Term Typically Offered:** Spring only – odd years

Formulation and analysis of mathematical models with emphasis on real systems applications. Introduction to Queueing theory and Markov Processes for application.

**STAT 191. Community Service Learning in Statistics. 1 Unit**

**Prerequisite(s):** Stat 128 Service Learning may be required.

**Term Typically Offered:** Fall, Spring

15-20 hours of volunteer work in the community related to statistics. Students will choose a project and submit a proposal for instructor review and approval. Students are encouraged to seek out opportunities that will benefit the community.  
Credit/No Credit

**STAT 192. Statistics Capstone Project. 3 Units**

**Prerequisite(s):** Stat 128, Stat 115A, Stat 140A, Stat 191 Service Learning may be required.

**Term Typically Offered:** Spring only

Capstone course for statistics majors. Students work in small groups on a project that brings together skills developed across multiple upper division statistics courses. In a typical project, students will define a complex problem, create a data analysis plan, learn and apply new methodologies, communicate with clients, write statistical reports, and present results to an audience.

**Note:** Stat 115B is a recommended prerequisite.

**STAT 196J. Statistical Computing. 3 Units**

**Prerequisite(s):** STAT 1 or STAT 50, and MATH 26A or MATH 30

**Term Typically Offered:** Fall only

Computer methods for accessing, transforming, summarizing, graphing, and making statistical inferences from data. Both a command-line statistical software package such as R and menu-driven package such as SAS will be used. Students will learn to apply computer methods to solve problems selected from the areas of modeling, simulation, inference and statistical learning. The intent of this course is to provide students with the software skills needed for statistical work in industry or academia.

**STAT 196L. Linear Models. 3 Units**

**Prerequisite(s):** (Stat 1 or Stat 50) and (Math 35 or Math 100); an introductory programming course such as Math 64 or Stat 128 is recommended.

**Term Typically Offered:** Fall, Spring

Practical statistical modeling of data using professional-grade statistical software. Simple and multiple linear regression; analysis of variance; logistic regression; variable transformation; variable selection; model selection; residual analysis.

**STAT 196M. Introduction to Statistical Learning. 3 Units**

**Prerequisite(s):** (Stat 1 or Stat 50) and (Math 35 or Math 100); Math 64, Stat 128, or a similar introductory programming course is recommended. Stat 196L or a similar introductory linear regression course recommended.

**Term Typically Offered:** Fall, Spring

Practical statistical modeling of data using professional-grade software. Principles, methodologies, and applications of supervised techniques such as classification, resampling, model selection, nonlinear regression, and tree-based methods; unsupervised techniques including clustering and dimension reduction.

**STAT 199. Special Problems. 1 - 6 Units**

**Term Typically Offered:** Fall, Spring

Individual projects or directed reading. Open only to students who appear competent to carry on individual work. Admission to this course requires approval of the instructor in addition to the approval of the advisor and the Department Chair.

Credit/No Credit

**STAT 215A. Introduction to Mathematical Statistics. 3 Units**

**Prerequisite(s):** STAT 115A, STAT 115B; MATH 134 is recommended.

**Term Typically Offered:** Fall, Spring

Probability measure, conditional probability and independence, random variables, characteristic and moment-generating functions, modes of convergence.

**STAT 299. Special Problems. 1 - 6 Units**

**Term Typically Offered:** Fall, Spring

Any properly qualified student who wishes to pursue a problem may do so if the proposed subject is acceptable to the department committee, the supervising instructor and the student's advisor.