

STATISTICS (STAT)

College of Natural Science and Mathematics

Department of Mathematics and Statistics (<https://www.uaf.edu/dms/>)
907-474-7332

STAT F200X Elementary Statistics (m)

3 Credits

Offered Fall and Spring

Introduction to concepts and applications of elementary statistical methods. Topics include sampling and data analysis, descriptive statistics, elementary probability, probability and sampling distributions, confidence intervals, hypothesis testing, correlation, and simple linear regression.

Prerequisites: Appropriate placement score; or a grade of B or better in MATH F105 or MATH F105N or in all three of MATH F105G and MATH F105H and MATH F105J; or grade of C- or better in a math course numbered F122 or above.

Attributes: UAF GER Mathematics Req

Lecture + Lab + Other: 3 + 0 + 0

STAT F300 Statistics

3 Credits

Offered Fall and Spring

A calculus-based course emphasizing applications. Topics include probability, joint and conditional probability, expectation and variance, parameter estimation (method of moments and maximum likelihood), one and two sample hypothesis tests, simple linear regression and one-way analysis of variance.

Prerequisites: MATH F230X or MATH F251X or placement.

Lecture + Lab + Other: 3 + 0 + 0

STAT F401 Regression and Analysis of Variance

4 Credits

Offered Fall and Spring

Multiple regression including multiple and partial correlation, extra sum of squares principle, indicator variables, polynomial models, model selection, and assessment of underlying assumptions. Analysis of variance and covariance for multifactor studies in completely random and randomized complete block designs, multiple comparisons and orthogonal contrasts. Matrix concepts are taught as needed.

Prerequisites: STAT F200X or STAT F300.

Corequisites: STAT F401L.

Lecture + Lab + Other: 3 + 3 + 0

STAT F401L STAT F401 Laboratory

0 Credit

Offered Fall and Spring

Computer laboratory section for STAT F401 Regression and Analysis of Variance. Activities may include case studies involving the application of lecture topics and methods in R software.

Corequisites: STAT F401.

Lecture + Lab + Other: 0 + 3 + 0

STAT F402 Scientific Sampling

3 Credits

Offered Fall

Sampling methods, including simple random, stratified and systematic and one- and two-stage cluster sampling; estimation procedures, including ratio and regression methods; special area and point sampling procedures; optimum allocation. Adaptive and probability sampling; bootstrapping and basic mark-and-recapture.

Prerequisites: STAT F200X or STAT F300.

Lecture + Lab + Other: 3 + 0 + 0

STAT F454 Statistical Consulting Seminar

1 Credit

Offered Spring

Introduction to statistical consulting and data analysis. Emphasis on interaction with researchers and identification of scientific and statistical issues relevant to the research problem. Includes regular class meetings as well as supervised meetings with researchers. Designed to combine mathematical statistics with applications from a variety of fields. Students from any field of study with strong quantitative skills are encouraged to enroll. May be repeated for a total of three credits.

Prerequisites: STAT F200X or STAT F300; STAT F401; and MATH F408.

Stacked with STAT F654.

Lecture + Lab + Other: 1 + 0 + 0

STAT F461 Applied Multivariate Statistics

3 Credits

Offered Spring Even-numbered Years

Estimation and hypothesis testing, multivariate normality and its assessment, multivariate one and two sample tests, confidence regions, multivariate analysis of variance, discrimination and classification, principal components, factor analysis, clustering techniques and graphical presentation. Statistical computing packages utilized in assignments.

Prerequisites: STAT F401.

Lecture + Lab + Other: 3 + 0 + 0

STAT F602 Experimental Design

3 Credits

Offered Fall Even-numbered Years

Constructing and analyzing designs for experimental investigations; completely randomized, randomized block and Latin-square designs, split-plot design, incomplete block design, confounded factorial designs, nested designs, treatment of missing data, comparison of designs.

Prerequisites: STAT F401.

Lecture + Lab + Other: 3 + 0 + 0

STAT F605 Spatial Statistics

3 Credits

Offered Spring Even-numbered Years

Stochastic processes and variograms. Geostatistics including kriging and spatial design of experiments. Point processes including model selection and K-functions. Lattice process models and image analysis. Computer-intensive statistical methods.

Prerequisites: STAT F401; MATH F251X; MATH F252X; MATH F253X.

Lecture + Lab + Other: 3 + 0 + 0

STAT F611 Time Series

3 Credits

Offered Spring Odd-numbered Years

An applied course in time series and repeated measure analysis. Autoregression and moving average models. Estimation of parameters and tests. Prediction. Spectral analysis. Analysis of repeated measures data.

Prerequisites: STAT F401.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F621 Nonparametric Statistics**

3 Credits

Offered Fall Odd-numbered Years

Traditional and modern nonparametric statistical techniques. Distribution-free methods for small samples including sign, rank and randomization tests, correlation estimators, and bootstrapping. Modern techniques including kernel density estimation, survival analysis models, kernel and spline regression, generalized additive models, classification methods, robust estimation, regression trees, and neural net models.

Prerequisites: STAT F401.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F631 Categorical Data Analysis**

3 Credits

Offered Fall Odd-numbered Years

Statistical methods designed for count and categorical data. Contingency tables. Logistic and related models. Log-linear models. Repeated categorical responses. Survival data.

Prerequisites: STAT F401.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F641 Bayesian Statistics**

3 Credits

Offered Fall Even-numbered Years

Bayes' Rule, Bayesian models for univariate data, prior selection (conjugate and non-conjugate, noninformative and objective priors). Single parameter and multiparameter models. Hierarchical, general linear and mixed models. Study of posterior simulation techniques including Markov chain Monte Carlo. Model validation and model selection. Emphasis on applications, using modern statistical software packages.

Prerequisites: MATH F252X; (MATH F371 and MATH F408) or STAT F651.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F642 Bayesian Decision Theory for Resource Management**

4 Credits

Offered Spring Even-numbered Years

Application of decision theory to problems in natural resources management. Students will learn to perform Bayesian calculations and uncomplicated decision analysis themselves.

Prerequisites: FISH F621.**Cross-listed with** FISH F642.**Lecture + Lab + Other:** 2 + 2 + 0**STAT F651 Statistical Theory I**

3 Credits

Offered Fall

Probability and distribution of random variables. Conditional probability and stochastic independence. Distributions of functions of random variables. Expected values. Limiting distributions. Distributions derived from the normal distribution. Designed to combine mathematical statistics with applications from a variety of fields. Students from any field of study with strong quantitative skills are encouraged to enroll.

Prerequisites: MATH F253X; MATH F314; previous statistics course.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F652 Statistical Theory II**

4 Credits

Offered Spring Odd-numbered Years

Estimation of parameters. Efficiency and sufficiency. Hypothesis testing. The Neyman-Pearson paradigm and likelihood ratio tests. Data summaries. Bootstrap. Comparison of two samples. Linear least squares. Analysis of categorical data. Bayesian inference. Designed to combine mathematical statistics with applications from a variety of fields. Students from any field of study with strong quantitative skills are encouraged to enroll.

Prerequisites: STAT F651.**Lecture + Lab + Other:** 4 + 0 + 0**STAT F653 Statistical Theory III: Linear Models**

3 Credits

Offered Spring Even-numbered Years

Best linear unbiased estimation in the general linear model, Gauss-Markov theory and applications, maximum likelihood estimation for linear models, multivariate normal distributions, linear regression and analysis of variance, weighted regression, robust and nonlinear regression and generalized linear models. Designed to combine mathematical statistics with applications from a variety of fields. STAT F401 or equivalent course in applied linear regression modeling is strongly recommended.

Prerequisites: STAT F651 or MATH F371; MATH F253X; MATH F314.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F654 Statistical Consulting Seminar**

1 Credit

Offered Spring

Introduction to statistical consulting and data analysis. Emphasis on interaction with researchers and identification of scientific and statistical issues relevant to the research problem. Includes regular class meetings as well as supervised meetings with researchers. Designed to combine mathematical statistics with applications from a variety of fields. Students from any field of study with strong quantitative skills are encouraged to enroll. May be repeated for a total of three credits.

Prerequisites: STAT F200X or STAT F300; STAT F401; and MATH F408.**Stacked with** STAT F454.**Lecture + Lab + Other:** 1 + 0 + 0**STAT F661 Sampling Theory**

3 Credits

Offered As Demand Warrants

Statistical theory for sampling and sample surveys. Choice of method, power and sample size considerations, treatment of sampling and non-sampling biases. Sampling methods based on detectability. Adaptive sampling. Spatial sampling. Mark and recapture methods. The jackknife, the bootstrap and resampling plans.

Prerequisites: STAT F200X; STAT F401.**Lecture + Lab + Other:** 3 + 0 + 0**STAT F671 Statistical Computing**

3 Credits

Offered Spring Odd-numbered Years

Topics in statistical programming which may include Advanced R, program design, parallel processing, object oriented programming, functions, environments, debugging, loops and their replacements, C++ in R and code optimization. Optimizers, linear programming, random number generators including MCMC. Web applications. Writing R packages. Reproducible research. Text mining and relational databases.

Prerequisites: STAT F401; MATH F251X or MATH F230X; Knowledge of basic R highly recommended.**Lecture + Lab + Other:** 3 + 0 + 0

STAT F692 Seminar

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0**STAT F692P Seminar**

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0**STAT F698 Non-thesis Research/Project**

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0