

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

Grading System: Letter Grades with option of Plus/Minus

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

Grading System: Letter Grades with option of Plus/Minus

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

Grading System: Letter Grades with option of Plus/Minus

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

Grading System: Non-Graded

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

Grading System: Letter Grades with option of Plus/Minus

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.

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

Stacked with STAT F654.

Special Notes: Students from any field of study with strong quantitative skills are encouraged to enroll.

Lecture + Lab + Other: 1 + 0 + 0

Grading System: Pass/Fail Grades

Repeatable for Credit: May be taken 3 times for up to 3 credits

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

Grading System: Letter Grades with option of Plus/Minus

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

Grading System: Letter Grades with option of Plus/Minus

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

Grading System: Letter Grades with option of Plus/Minus

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**Grading System:** Letter Grades with option of Plus/Minus**STAT F621 Nonparametric Statistics and Machine Learning**

3 Credits

Offered Fall Odd-numbered Years

A survey course in nonparametric statistical techniques. Distribution-free methods for small samples including sign, rank and randomization tests and bootstrapping. Modern techniques including kernel density estimation, survival analysis, spline regression and generalized additive models. Classification methods including regression trees, support vector machines and neural net models.

Prerequisites: STAT F401.**Lecture + Lab + Other:** 3 + 0 + 0**Grading System:** Letter Grades with option of Plus/Minus**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**Grading System:** Letter Grades with option of Plus/Minus**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**Grading System:** Letter Grades with option of Plus/Minus**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.

Prerequisites: MATH F253X; MATH F314; previous statistics course.**Special Notes:** Students from any field of study with strong quantitative skills are encouraged to enroll.**Lecture + Lab + Other:** 3 + 0 + 0**Grading System:** Letter Grades with option of Plus/Minus**STAT F652 Statistical Theory II**

3 Credits

Offered Spring Odd-numbered Years

Data reduction concepts, including sufficiency, ancillarity, completeness. Point estimation and interval estimation of parameters. Bootstrapping. Hypothesis testing, including the Neyman-Pearson paradigm and likelihood ratio tests. Asymptotic properties of estimators. Bayesian inference. Designed to combine mathematical statistics with applications from a variety of fields.

Prerequisites: STAT F651.**Special Notes:** Students from any field of study with strong quantitative skills are encouraged to enroll.**Lecture + Lab + Other:** 3 + 0 + 0**Grading System:** Letter Grades with option of Plus/Minus**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.

Prerequisites: STAT F651 or MATH F371; MATH F253X; MATH F314.**Special Notes:** STAT F401 or equivalent course in applied linear regression modeling is strongly recommended.**Lecture + Lab + Other:** 3 + 0 + 0**Grading System:** Letter Grades with option of Plus/Minus**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.

Prerequisites: MATH F408; STAT F200X or STAT F300; STAT F401.**Stacked with** STAT F454.**Special Notes:** Students from any field of study with strong quantitative skills are encouraged to enroll.**Lecture + Lab + Other:** 1 + 0 + 0**Grading System:** Pass/Fail Grades**Repeatable for Credit:** May be taken 3 times for up to 3 credits**STAT F661 Sampling Theory**

3 Credits

Offered Fall

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**Grading System:** Letter Grades with option of Plus/Minus

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

Grading System: Letter Grades with option of Plus/Minus

STAT F692 Seminar

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0

Grading System: Letter Grades with option of Plus/Minus

Repeatable for Credit: May be taken unlimited times for up to 99 credits

STAT F692P Seminar

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0

Grading System: Pass/Fail Grades

Repeatable for Credit: May be taken unlimited times for up to 99 credits

STAT F698 Non-thesis Research/Project

1-6 Credits

Lecture + Lab + Other: 0 + 0 + 0

Grading System: Pass/Fail Grades

Repeatable for Credit: May be taken unlimited times for up to 99 credits