

# STAT Statistics

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## STAT 2231 Introduction to Statistics I

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Measures of central tendency and dispersion; probability distributions; inferences concerning means and proportions; goodness of fit; correlation; linear regression. Prerequisite(s): A minimum grade of "C" or better in MATH 1001 or higher.

## STAT 2232 Introduction to Statistics II

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

A continuation of STAT 2231. The focus is on inferential procedures to compare the same characteristic between two or more populations and inferential procedures to investigate the relationship between two or more variables from the same population. Topics include tests of association, regression, correlation, and analysis of variance. The statistical software package SPSS is used.

**Prerequisite(s):** A minimum grade of "C" in STAT 2231 or MATH 1401.

## STAT 3130 Applied Statistics

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introductory course in applied statistics for students in the natural sciences, social sciences, health and professional studies, technology, and business. The material covered will provide an introduction to statistical concepts and terminology while focusing on descriptive and inferential methods of data analysis. Both parametric and nonparametric methods are presented for the analysis of central tendency, variability, proportions, and categorical data. Topics covered also include regression and correlation.

**Prerequisite(s):** MATH 1111.

## STAT 3211 Probability & Statistics App I

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Data collection, organization and description; probability, random variables; discrete and continuous probability distributions; Central Limit Theorem; point and interval tests of hypotheses; simple linear regression and correlation.

## STAT 3222 Probability & Statistics Ap II

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Sampling techniques, multiple linear regression, nonparametric statistics, and MANNOVA.

**Prerequisite(s):** A minimum grade of "C" in MATH 2160 and STAT 3211.

## STAT 3231 Mathematical Statistics I

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Probability, properties of discrete and random variables, joint and conditional distributions, expectation, and transformations.

## STAT 3232 Mathematical Statistics II

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Central limit theorem, point and interval estimation, sampling distributions, sufficient statistics, and hypothesis testing.

**Prerequisite(s):** A minimum grade of "C" in STAT 3231.

## STAT 3240 Experimental Design

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Completely randomized and randomized block designs, incomplete block designs, fixed, random, and mixed effect models, split plot designs, nested experiments, analysis of covariance, and factorial experiments.

**Prerequisite(s):** A minimum grade of "C" in STAT 3211 or STAT 3231.

## STAT 4090 Selected Topics in Statistics

**1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.**

Specialized study in a selected area of Statistics. Prerequisite(s): Permission of instructor required.

## STAT 4890 Directed Study in Statistics

**1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.**

Directed study under faculty supervision. Well-prepared statistics students may be permitted to enroll in an independent study upon the recommendation of a Statistics faculty member. Prerequisite(s): Permission of instructor and Department Chair required.

## STAT 5130 Sampling and Survey Methods

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to the design and analysis of sample surveys suitable for students in business, social sciences, and biological sciences in addition to the mathematical sciences. Comparison of simple random sampling, stratified, systemic, cluster and multistage sampling. Emphasis on appropriate sample type and estimation of parameters.

**Prerequisite(s):** A minimum grade of "C" in STAT 2231 or MATH 1401.

**Cross Listing(s):** STAT 5130G.

## STAT 5130G Sampling and Survey Methods

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introduction to the design and analysis of sample surveys suitable for students in business, social sciences, and biological sciences in addition to the mathematical sciences. Comparison of simple random sampling, stratified, systemic, cluster and multistage sampling. Emphasis on appropriate sample type and estimation of parameters. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require a higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

**Prerequisite(s):** A minimum grade of "C" in STAT 2231.

**Cross Listing(s):** STAT 5130.

## STAT 5330 Introduction to Mathematical Statistics

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introductory course intended to present a solid foundation in statistical theory, and, at the same time, to provide an indication of the relevance and importance of the theory in solving practical problems in the real world. Topics include, moments and moment-generating functions, point and interval estimation, test of statistical hypothesis, contingency tables and goodness-of-fit, nonparametric methods, and introduction to linear models.

**Prerequisite(s):** A minimum grade of "C" in MATH 3337.

**Cross Listing(s):** STAT 5330G.

## STAT 5330G Introduction to Mathematical Statistics

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

An introductory course intended to present a solid foundation in statistical theory, and, at the same time, to provide an indication of the relevance and importance of the theory in solving practical problems in the real world. Topics include, moments and moment-generating functions, point and interval estimation, test of statistical hypothesis, contingency tables and goodness-of-fit, nonparametric methods, and introduction to linear models. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor. Prerequisite(s): A minimum grade of "C" in MATH 3337. Cross Listing(s): STAT 5330.

## STAT 5531 Statistical Methods I

**3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This is the first of a two course sequence in applied statistics. The material covered will provide an introduction to statistical concepts and terminology while focusing on descriptive and inferential methods of data analysis. Topics include descriptive statistics, parameter estimation, tests of significance, confidence intervals, analysis of variance, simple linear regression and correlation, and resampling methods including bootstrapping. Both parametric and nonparametric methods are presented for the analysis of central tendency, variability, proportions and categorical data.

**Prerequisite(s):** A minimum grade of "C" in MATH 3337.

**Cross Listing(s):** STAT 5531G.

**STAT 5531G Statistical Methods I****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This is the first of a two course sequence in applied statistics. The material covered will provide an introduction to statistical concepts and terminology while focusing on descriptive and inferential methods of data analysis. Topics include descriptive statistics, parameter estimation, tests of significance, confidence intervals, analysis of variance, simple linear regression and correlation, and resampling methods including bootstrapping. Both parametric and nonparametric methods are presented for the analysis of central tendency, variability, proportions and categorical data. Graduate students will be required to complete advanced level assignments in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.

**Prerequisite(s):** A minimum grade of "C" in MATH 3337.**Cross Listing(s):** STAT 5531.**STAT 5532 Statistical Methods II****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This is the second of a two course sequence in applied statistics. The material covered will provide an introduction to the ideas of linear models and experimental design while focusing on methods of data analysis using regression and analysis of variance. Topics include multiple regression analysis, analysis of variance with multiple classification, analysis of covariance, repeated measures analysis of variance, multiple comparison techniques, and diagnostic procedures and transformations. Suitable for students in business administration, economics, and the social, health and biological sciences.

**Prerequisite(s):** A minimum grade of "C" in STAT 5531.**Cross Listing(s):** STAT 5532G.**STAT 5532G Statistical Methods II****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

This is the second of a two course sequence in applied statistics. The material covered will provide an introduction to the ideas of linear models and experimental design while focusing on methods of data analysis using regression and analysis of variance. Topics include multiple regression analysis, analysis of variance with multiple classification, analysis of covariance, repeated measures analysis of variance, multiple comparison techniques, and diagnostic procedures and transformations. Suitable for students in business administration, economics, and the social, health and biological sciences. Graduate students will complete assignments beyond the scope of the undergraduate requirements. These assignments require higher-level mastery of the subject matter and additional deliverables representative of graduate-level work, as determined by the instructor.

**Prerequisite(s):** A minimum grade of "C" in STAT 5531. **Cross Listing(s):** STAT 5532.**STAT 7090 Selected Topics in Statistics****1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.**

Selected study in a selected area of Statistics.

**Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.**STAT 7130 Applied Multivariate Statistical Analysis****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Estimating and inference from the multivariate normal distribution, Hotelling's T<sup>2</sup>, multivariate analysis of variance, multivariate regression, multivariate experimental design, principle component analysis, factor analysis, discriminate analysis and cluster analysis.

**Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.**STAT 7132 Applied Nonparametric Statistics****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Review of probability and statistical inference; binomial, quantile and sign tests; contingency tables; methods based on ranks. **Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.

**STAT 7134 Applied Regression Analysis****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Simple and multiple linear regression, model selection, residual analysis, influence diagnostics, transformation of data to fit assumptions, multicollinearity and an introduction to nonlinear regression.

**Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.**STAT 7135 Analysis of Discrete Data****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

The study of discrete univariate and multivariate distributions and generating functions, two-way and higher dimensional contingency tables, chi-squared and other goodness-of-fit tests, Cochran-Mantel-Hanzel procedure, binary and multinomial response models, log-linear models, theoretical foundations for the generalized linear models, mixed generalized linear models, longitudinal and spatial data analysis.

**Prerequisite(s):** Completion of STAT 7331 and STAT 5531, with a minimum grade of "C".**STAT 7231 Design of Experiments I****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Various statistically designed experiments are introduced including randomized blocks designs, Latin squares, incomplete block designs, factorial and fractional factorial designs with and without confounding and nested designs. **Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.

**STAT 7232 Design of Experiments II****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Response surface methodology is introduced. First- and second-order models and designs are studied which includes determining optimum conditions and methods of estimating response surfaces. Multiresponse experiments, nonlinear response surface models, and mixture designs are also studied.

**Prerequisite(s):** Completion of STAT 7231.**STAT 7234 Statistical Process Control****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Philosophy of statistical process control is studied along with SPC techniques of control charts, process-capability, designed experiments and acceptance sampling. **Prerequisite(s):** Completion of STAT 5531 or STAT 5531G.

**STAT 7331 Mathematical Statistics I****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Random variables, density functions, mathematical expectation, discrete and continuous distributions, moments and moment-generating functions and limiting distributions.

**Prerequisite(s):** Completion of MATH 2242 and MATH 3337.**STAT 7332 Mathematical Statistics II****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Rigorous introduction/development of interval estimation, test of significance, comparison of "k" means, randomized block design, multiple comparison procedures, nonparametric test and linear regression. The general linear model will be introduced.

**Prerequisite(s):** Completion of STAT 7331.**STAT 7430 Actuarial Mathematics****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Survival distributions and life tables, life insurance, life annuities, net premiums, multiple life functions, multiple decrement models, valuation theory for pension plans, collective risk models, population theory and theory of pension funding.

**Prerequisite(s):** Completion of STAT 7331.**STAT 7432 Applied Stochastic Processes****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Poisson process, renewal theory, Markov chains, Brownian motion, random walks and Martingales and stochastic order relations.

**Prerequisite(s):** A minimum grade of "C" in STAT 7331.

**STAT 7434 Applied Time Series Analysis****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Basic ideas of stochastic model building techniques with applications are discussed. Properties of the autocorrelation function and the spectrum of stationary processes are investigated. Models studied include the linear stationary ARMA and linear non-stationary ARIMA models along with forecasting models. Prerequisite(s): Completion of STAT 7331.

**STAT 7436 Reliability Analysis****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Probabilistic models for the reliability of coherent systems, statistical models for lifetimes of components and repairable systems, including the nonhomogeneous Poisson process, reliability estimation and prediction, MIL standards and accelerated life testing.

**Prerequisite(s):** Completion of STAT 7331.

**STAT 7530 Statistical Computing I****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Basic computer organization and computer arithmetic are investigated. Programming languages and statistical software packages are explored. Methods for approximating cumulative distribution function and percentage points of a probability distribution are studied including nonparametric procedures. Multiple comparison procedures are also examined. Random number generation and statistical tests for testing random number generators are explored.

**Prerequisite(s):** Completion of STAT 7331.

**STAT 7532 Statistical Computing II****3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.**

Various computational methods in linear algebra as applied to such statistical methods as multiple linear regression, designed experiments, multivariate analysis and the general linear model. Further topics include computational methods for unconstrained optimization, nonlinear regression and model fitting based on criteria other than least squares.

**Prerequisite(s):** Completion of STAT 5532 or STAT 5532G and STAT 7331.

**STAT 7610 Graduate Seminar****1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.**

Students will research topics related to their major/concentration, under supervision of one or more faculty members. Each student will present results on topics of interest to the class on new developments in mathematical sciences, or on his/her research project. Faculty members also may present lectures for the benefit of the students. Course may be repeated up to a maximum of 3 credit hours to be counted toward the M.S. in Mathematics.

**Cross Listing(s):** MATH 7610.

**STAT 7890 Directed Study in Statistics****1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.**

Directed study under faculty supervision. Prerequisite(s): Permission of instructor and Department Chair.

**STAT 7895 Research****1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.**

Graduate students will conduct a program of independent research under the direction of a thesis advisor or an advisory committee on a topic in Statistics. Results of the research will be presented as a thesis in MATH 7999 for partial fulfillment of the requirement of the Master of Science Degree in Mathematics with an emphasis in Statistics.

**STAT 7899 Research Project in Statistics****1-6 Credit Hours. 1-6 Lecture Hours. 0-4 Lab Hours.**

Research project addressed toward a real world problem. Prerequisite(s): Permission of project advisor and Department Chair required.