

STATISTICS (STAT)

Course Descriptions

STAT 530 Applied Regression Analysis 3 Credit Hours

Topics include single variable linear regression, multiple linear regression and polynomial regression. Model checking techniques based on analysis of residuals will be emphasized. Remedies to model inadequacies such as transformation will be covered along with basic time series analysis and forecasting using moving averages and autoregressive models with prediction errors. Statistical packages will be used. Additional assignments in logistic regression and forecasting will distinguish this course from its undergraduate version, STAT 430. Students are encouraged to take MATH 227 or a similar course before STAT 530. Students cannot receive credit for both STAT 430 and STAT 530. (F, W).

Prerequisite(s): STAT 325 or MATH 425 or MATH 525 or IMSE 317 or (STAT 301 and STAT 305)

Restriction(s):

Can enroll if Level is Rackham or Graduate

STAT 531 Machine Learning and Computational Statistics 3 Credit Hours

Computational models trained with high dimensional data are increasingly important in industry and many academic disciplines. We will cover a wide range of topics in machine learning and statistical programming that enhance learning from data. Topics include an introduction to statistical learning, a review of simple and multiple linear regression, logistic regression, classification with linear and quadratic discriminant analysis and naïve Bayes, variable selection, shrinkage methods, dimension reduction methods, decision trees, deep learning (neural networks), and clustering methods. Students cannot receive credit for both STAT 431 and STAT 531. (W).

Prerequisite(s): STAT 325 or MATH 325 or IMSE 317 or ME 364 or IMSE 510 or (STAT 301 and STAT 305)

STAT 535 Data Analysis and Modeling 3 Credit Hours

Linear models including models with factors associated with both fixed and random effects together with covariates. Models containing more complex covariance structure including repeated measures and time dependence. The statistical processing package SAS will be used extensively to analyze data associated with such models. The SAS procedures Proc GLM, Proc REG, and Proc Mixed will be used extensively in examples, assignments, and projects. (OC).

Restriction(s):

Can enroll if Class is Graduate

STAT 540 Design and Analysis of Experiments 3 Credit Hours

An introduction to the basic methods of designed experimentation. Fixed and random effects models together with the analysis of variance techniques will be developed. Specialized designs including randomized blocks, latin squares, nested, full, and fractional factorials will be studied. The statistical computer package R will be used. In addition to the course prerequisite, students are strongly encouraged to complete STAT 305 or a similar course prior to enrolling in STAT 540 for a more comprehensive understanding. Students cannot receive credit for both STAT 440 and STAT 540. (W, AY).

Prerequisite(s): STAT 301 or STAT 325 or MATH 425 or MATH 525 or IMSE 317 or IMSE 510

STAT 555 Environmental Statistics 3 Credit Hours

A wide variety of statistical tests important in environmental sciences will be covered through the use of case studies. Theory and applications of datasets, data displays, and formal statistical inference will be discussed. Students will obtain direct experience with the study and analysis of data, do projects, and write reports. Students cannot receive credit for both STAT 455 and STAT 555. (W, AY).

Restriction(s):

Can enroll if Class is Graduate

STAT 560 Time Series Analysis 3 Credit Hours

An introduction to time series, including trend effects and seasonality, while assuming only a limited knowledge of higher-level mathematics. Topics include: linear Gaussian processes, stationarity, autocovariance, and autocorrelation; autoregressive (AR), moving average (MA), and mixed (ARMA) models for stationary processes; likelihood in a simple case such as AR(1); ARIMA processes, differencing, seasonal ARIMA as models for non-stationary processes; the role of sample autocorrelation, partial autocorrelation, and correlograms in model choice; inference for model parameters; forecasting: dynamic linear models and the Kalman filter. Students cannot receive credit for both STAT 460 and STAT 560. (F, AY).

Prerequisite(s): STAT 530

STAT 590 Topics in Applied Statistics 3 Credit Hours

A course designed to offer selected topics in applied statistics. The specific topic will be announced together with the prerequisites when offered. Course may be repeated for credit when specific topic differs. (OC)

Restriction(s):

Can enroll if Level is Rackham or Graduate

STAT 597 Independent Study in Statistics 1 to 3 Credit Hours

This course is an independent study in statistics topics at the graduate level. Topics and objectives are chosen by agreement between students and the instructor. (OC).

STAT 599 Independent Research Project 1 to 3 Credit Hours

Independent research project in statistics with a faculty or industrial collaborator under the supervision of a faculty member. (YR).

*An asterisk denotes that a course may be taken concurrently.

Frequency of Offering

The following abbreviations are used to denote the frequency of offering: (F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally