STATISTICS (STAT)

STAT Class Schedule (https://courses.illinois.edu/schedule/DEFAULT/DEFAULT/STAT)

Courses

STAT 100  Statistics  credit: 3 Hours.
First course in probability and statistics at a precalculus level; emphasizes basic concepts, including descriptive statistics, elementary probability, estimation, and hypothesis testing in both nonparametric and normal models. Credit is not given for both STAT 100 and any one of the following: ECON 202, PSYC 235, or SOC 485. Prerequisite: MATH 012. This course satisfies the General Education Criteria for: UIUC: Quant Reasoning I

STAT 200  Statistical Analysis  credit: 3 Hours.
Survey of statistical concepts, data analysis, designed and observational studies and statistical models. Statistical computing using a statistical package such as R or a spreadsheet. Topics to be covered include data summary and visualization, study design, elementary probability, categorical data, comparative experiments, multiple linear regression, analysis of variance, statistical inferences and model diagnostics. May be taken as a first statistics course for quantitatively oriented students, or as a second course to follow a basic concepts course. This course satisfies the General Education Criteria for: UIUC: Quant Reasoning I

STAT 212  Biostatistics  credit: 3 Hours.
Application of statistical reasoning and statistical methodology to biology. Topics include descriptive statistics, graphical methods, experimental design, probability, statistical inference and regression. In addition, techniques of statistical computing are covered. Credit is not given for both STAT 212 and STAT 200. This course satisfies the General Education Criteria for: UIUC: Quant Reasoning I

STAT 385  Statistics Programming Methods  credit: 3 Hours.
Statisticians must be savvy in programming methods useful to the wide variety of analysis that they will be expected to perform. This course provides the foundation for writing and packaging statistical algorithms through the creation of functions and object oriented programming. Fundamental programming techniques and considerations will be emphasized. Students will also create dynamic reports that encapsulate their implemented algorithms. Students must have access to a computer on which they can install software. Prerequisite: STAT 200 or STAT 212.

STAT 390  Individual Study  credit: 1 or 2 Hours.
May be repeated to a maximum of 6 hours. Prerequisite: Consent of instructor.

STAT 391  Honors Individual Study  credit: 1 or 2 Hours.
May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

STAT 400  Statistics and Probability I  credit: 4 Hours.
Introduction to mathematical statistics that develops probability as needed; includes the calculus of probability, random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing. Offers a basic one-term introduction to statistics and also prepares students for STAT 410. Same as MATH 463. 4 undergraduate hours. 4 graduate hours. Prerequisite: MATH 241 or equivalent.

STAT 408  Actuarial Statistics I  credit: 4 Hours.
Examines elementary theory of probability, including independence, conditional probability, and Bayes' theorem; combinations and permutations; random variables, expectations, and probability distributions; joint and conditional distributions; functions of random variables; sampling; central limit theorem. Same as MATH 408. 4 undergraduate hours. 4 graduate hours. Credit is not given for both STAT 408 and either MATH 461 or STAT 400. Prerequisite: MATH 241 or equivalent.

STAT 409  Actuarial Statistics II  credit: 4 Hours.
Continuation of STAT 408. Examines parametric point and interval estimation, including maximum likelihood estimation, sufficiency, completeness, and Bayesian estimation; hypothesis testing; linear models; regression and correlation. Same as MATH 409. 4 undergraduate hours. 4 graduate hours. Credit is not given for both STAT 409 and STAT 410. Prerequisite: STAT 408.

STAT 410  Statistics and Probability II  credit: 3 or 4 Hours.
Continuation of STAT 400. Examines moment-generating functions, transformations of random variables, normal sampling theory, sufficiency, best estimators, maximum likelihood estimators, confidence intervals, most powerful tests, unbiased tests, and chi-square tests. Credit is not given for both STAT 410 and STAT 409. Prerequisite: STAT 400; or STAT 100 and MATH 461.

STAT 420  Methods of Applied Statistics  credit: 3 or 4 Hours.
Systematic, calculus-based coverage of the more widely used methods of applied statistics, including simple and multiple regression, correlation, analysis of variance and covariance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests; emphasizes when and why various tests are appropriate and how they are used. Same as MATH 469. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 408 or STAT 400; MATH 231 or equivalent; knowledge of basic matrix manipulations; or consent of instructor.

STAT 424  Analysis of Variance  credit: 3 or 4 Hours.
Estimation and hypotheses testing in linear models; one-, two-, and higher-way layouts; incomplete layouts; analysis of covariance; and random effects models and mixed models. 3 undergraduate hours. 4 graduate hours. Prerequisite: Credit or concurrent registration in MATH 415 and STAT 410.

STAT 425  Applied Regression and Design  credit: 3 or 4 Hours.
Explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, factorial designs, randomized complete block designs, Latin squares, split plot designs. Computer work is an integral part of the course. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 408.

STAT 426  Sampling and Categorical Data  credit: 3 or 4 Hours.
Sampling: simple random, stratified, systematic, cluster, and multi-stage sampling. Categorical data: multiway contingency tables, maximum likelihood estimation, goodness-of-fit tests, model selection, logistic regression. Computer work is an integral part of the course. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 410.

STAT 427  Statistical Consulting  credit: 3 or 4 Hours.
Students, working in groups under the supervision of the instructor, consult with faculty and graduate students through the Statistical Consulting Service; readings from literature on consulting. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 425 or consent of instructor.

Information listed in this catalog is current as of 12/2015
STAT 428  Statistical Computing  credit: 3 or 4 Hours.
Examines statistical packages, numerical analysis for linear and
nonlinear models, graphics, and random number generation and Monte
Carlo methods. Same as CSE 428. 3 undergraduate hours. 4 graduate
hours. Prerequisite: STAT 410 or equivalent; knowledge of a programming
language.

STAT 429  Time Series Analysis  credit: 3 or 4 Hours.
Studies theory and data analysis for time series; examines auto-
regressive moving average model building and statistical techniques;
and discusses spectral model building and statistical analysis
using windowed periodograms and Fast Fourier Transformations. 3
undergraduate hours. 4 graduate hours. Prerequisite: STAT 410.

STAT 430  Topics in Applied Statistics  credit: 3 or 4 Hours.
Formulation and analysis of mathematical models for random
phenomena; extensive involvement with the analysis of real data;
and instruction in statistical and computing techniques as needed. 3
undergraduate hours. 4 graduate hours. May be repeated with approval.
Prerequisite: STAT 410 or STAT 420; or consent of instructor.

STAT 440  Statistical Data Management  credit: 3 or 4 Hours.
The critical elements of data storage, data cleaning, and data extractions
that ultimately lead to data analysis are presented. Includes basic theory
and methods of databases, auditing and querying databases, as well
as data management and data preparation using standard large-scale
statistical software. Students will gain competency in the skills required
in storing, cleaning, and managing data, all of which are required prior
to data analysis. Same as CSE 440. 3 undergraduate hours. 4 graduate
hours. Prerequisite: STAT 400 or STAT 409.

STAT 443  Professional Statistics  credit: 3 or 4 Hours.
This project-based course emphasizes written, visual, and oral
communication of statistical results and conclusions. An introduction
to statistical consulting is also provided. Additional topics include
introductions to statistical methodologies in industry and aspects
of careers in statistics. 3 undergraduate hours. 4 graduate hours.
Prerequisite: STAT 420 or consent of instructor.

STAT 448  Advanced Data Analysis  credit: 4 Hours.
Several of the most widely used techniques of data analysis are
discussed with an emphasis on statistical computing. Topics include
linear regression, analysis of variance, generalized linear models, and
analysis of categorical data. In addition, an introduction to data mining
is provided considering classification, model building, decision trees, and
cluster analysis. Same as CSE 448. 4 undergraduate hours. 4 graduate
hours. Prerequisite: STAT 400 or STAT 409, and credit for or concurrent
registration in STAT 410.

STAT 458  Math Modeling in Life Sciences  credit: 3 or 4 Hours.
Same as ANSC 448 and IB 487. See ANSC 448.

STAT 466  Image and Neuroimage Analysis  credit: 3 or 4 Hours.
Same as PSYC 466. See PSYC 466.

STAT 480  Data Science Foundations  credit: 3 or 4 Hours.
Examines the methods of data management and analysis for "big data",
characterized by high volume, variety, velocity, and veracity. Attention
will be focused on advanced statistical analysis and visualization in
data science applications employing parallel processing, storage and
distribution techniques necessary for analysis of massive data sets.
Data mining techniques, machine learning methods, and streaming
technologies will be utilized for real-time analysis. Students must
have access to a computer on which they can install software. 3
undergraduate hours. 4 graduate hours. Prerequisite: STAT 425 and
familiarity with high-level language (e.g. Python, Java, C, F#),
and command line programming.

STAT 484  Ethical Practice of Statistics  credit: 3 or 4 Hours.
Same as PSYC 484. See PSYC 484.

STAT 510  Mathematical Statistics I  credit: 4 Hours.
Distributions, transformations, order-statistics, exponential families,
sufficiency, delta-method, Edgeworth expansions; uniformly minimum
variance unbiased estimators, Rao-Blackwell theorem, Cramer-Rao lower
bound, information inequality; equivariance. Prerequisite: STAT 410.

STAT 511  Mathematical Statistics II  credit: 4 Hours.
Bayes estimates, minimaxity, admissibility; maximum likelihood
estimation, consistency, asymptotic efficiency; testing and confidence
intervals; Neyman-Pearson lemma, uniformly most powerful tests;
likelihood ratio tests and large-sample approximation; nonparametrics.
Prerequisite: STAT 510.

STAT 525  Computational Statistics  credit: 4 Hours.
Various topics, such as ridge regression; robust regression; jackknife,
bootstrap, cross-validation and resampling plans; E-M algorithm;
projection pursuit; all with a strong computational flavor. Same as
CSE 525. May be repeated if topics vary. Prerequisite: STAT 425,
STAT 426, and STAT 511; or consent of instructor.

STAT 530  Bioinformatics  credit: 4 Hours.
Same as ANSC 543, CHBE 571, and MCB 571. See CHBE 571.

STAT 542  Statistical Learning  credit: 4 Hours.
Modern techniques of predictive modeling, classification, and clustering
are discussed. Examples of these are linear regression, nonparametric
regression, kernel methods, regularization, cluster analysis, classification
trees, neural networks, boosting, discrimination, support vector machines,
and model selection. Applications are discussed as well as computation
and theory. Same as CSE 542. Prerequisite: STAT 410 and STAT 425.

STAT 543  Appl. Multivariate Statistics  credit: 4 Hours.
Same as CPSC 543. See CPSC 543.

STAT 551  Theory of Probability I  credit: 4 Hours.
Same as MATH 561. See MATH 561.

STAT 552  Theory of Probability II  credit: 4 Hours.
Same as MATH 562. See MATH 562.

STAT 553  Probability and Measure I  credit: 4 Hours.
Measures and probabilities; integration and expectation; convergence
theorems and inequalities for integrals and expectations; independence;
convergence in probability, almost surely, and mean; Three Series
Theorem; laws of large numbers. Prerequisite: MATH 447 or consent of
instructor.
STAT 554  Probability and Measure II  credit: 4 Hours.
Measure extensions, Lebesgue-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem; Brownian Motion. Credit is not given for both STAT 554 and either MATH 561 or MATH 562.

STAT 555  Applied Stochastic Processes  credit: 4 Hours.
Same as MATH 564. See MATH 564.

STAT 571  Multivariate Analysis  credit: 4 Hours.
Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: STAT 410 and MATH 415, or consent of instructor.

STAT 575  Large Sample Theory  credit: 4 Hours.
Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric test statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Same as ECON 578. Prerequisite: STAT 511 and either MATH 561 or STAT 554.

STAT 578  Topics in Statistics  credit: 4 Hours.
May be repeated if topics vary. Prerequisite: Consent of instructor.

STAT 587  Hierarchical Linear Models  credit: 4 Hours.
Same as PSYC 587 and EPSY 587. See EPSY 587.

STAT 588  Covar Struct and Factor Models  credit: 4 Hours.
Same as EPSY 588, PSYC 588, and SOC 588. See PSYC 588.

STAT 590  Individual Study and Research  credit: 0 to 8 Hours.
Directed reading and research. Approved for letter and S/U grading. May be repeated with approval. Prerequisite: Consent of instructor.

STAT 593  STAT Internship  credit: 0 to 8 Hours.
Supervised, off-campus experience in a field in which statistical science plays an important role. Approved for letter and S/U grading. Prerequisite: STAT 425 and consent of instructor.

STAT 595  Preparing Future Faculty  credit: 2 Hours.
Prepares Ph.D. students who are interested in an academic career to develop a successful academic career path, and to prepare graduate students for their future roles as teachers, and researchers. The course will focus on profession, job search, research, teaching and service. The course will involve guest panels, small and large group presentations and interactive Q&A with student participation.

STAT 599  Thesis Research  credit: 0 to 16 Hours.
Approved for S/U grading only. May be repeated. Prerequisite: Consent of instructor.