STAT - STATISTICS

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

Courses

STAT 100  Statistics  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/STAT/100/)
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 112.
This course satisfies the General Education Criteria for:
Quantitative Reasoning I

STAT 107  Data Science Discovery  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/107/)
Data Science Discovery is the intersection of statistics, computation, and real-world relevance. As a project-driven course, students perform hands-on-analysis of real-world datasets to analyze and discover the impact of the data. Throughout each experience, students reflect on the social issues surrounding data analysis such as privacy and design. Same as CS 107 and IS 107.
This course satisfies the General Education Criteria for:
Quantitative Reasoning I

STAT 199  Undergraduate Open Seminar  credit: 1 to 5 Hours. (https://courses.illinois.edu/schedule/terms/STAT/199/)
See course schedule for topics. Approved for Letter and S/U grading. May be repeated if topics vary.

STAT 200  Statistical Analysis  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/STAT/200/)
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. Credit is not given for both STAT 200 and STAT 212.
This course satisfies the General Education Criteria for:
Quantitative Reasoning I

STAT 207  Data Science Exploration  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/207/)
Explores the data science pipeline from hypothesis formulation, to data collection and management, to analysis and reporting. Topics include data collection, preprocessing and checking for missing data, data summary and visualization, random sampling and probability models, estimating parameters, uncertainty quantification, hypothesis testing, multiple linear and logistic regression modeling, classification, and machine learning approaches for high dimensional data analysis. Students will learn how to implement the methods using Python programming and Git version control. Prerequisite: STAT 107 or consent of instructor.
This course satisfies the General Education Criteria for:
Quantitative Reasoning II

STAT 212  Biostatistics  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/STAT/212/)
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:
Quantitative Reasoning I

STAT 361  Probability & Statistics for Computer Science  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/STAT/361/)
Same as CS 361. See CS 361.

STAT 385  Statistics Programming Methods  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/STAT/385/)
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. (https://courses.illinois.edu/schedule/terms/STAT/390/)
May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

STAT 391  Honors Individual Study  credit: 1 or 2 Hours. (https://courses.illinois.edu/schedule/terms/STAT/391/)
May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

STAT 400  Statistics and Probability I  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/400/)
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 and STAT 425. Same as MATH 463. 4 undergraduate hours. 4 graduate hours. Prerequisite: MATH 231. Concurrent Enrollment in MATH 241 is required. Not intended for first-time freshmen.
STAT 408  Actuarial Statistics I  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/408/)
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 ASRM 401. 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. (https://courses.illinois.edu/schedule/terms/STAT/409/)
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 ASRM 402. 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. (https://courses.illinois.edu/schedule/terms/STAT/410/)
Continuation of STAT 400. Includes 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. Same as MATH 464. 3 undergraduate hours. 4 graduate hours. Credit is not given for both STAT 410 and STAT 409. Prerequisite: MATH 241 and STAT 400.

STAT 420  Methods of Applied Statistics  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/420/)
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 ASRM 450. 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. (https://courses.illinois.edu/schedule/terms/STAT/424/)
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  Statistical Modeling I  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/425/)
This is the foundation for advanced statistical modeling with a focus on multiple strategies for analyzing data. The course explores linear regression, least squares estimates, F-tests, analysis of residuals, regression diagnostics, transformations, model building, generalized and weighted least squares, PCA, A/B testing, randomization tests, ANOVA, random effects, mixed effects, and longitudinal data. Statistical computing is an integral part of the course. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 400; MATH 257 or MATH 415. Concurrent Enrollment in STAT 410 is preferred.

STAT 426  Statistical Modeling II  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/426/)
This is a continuation in the study of advanced statistical modeling techniques with a focus on categorical data. The course explores logistic regression, generalized linear models, goodness-of-fit, link functions, count regression, log-linear models, probability models for contingency tables, and ordinal response models. Statistical computing is an integral part of the course. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 400 or consent of instructor.

STAT 427  Statistical Consulting  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/427/)
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.

STAT 428  Statistical Computing  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/428/)
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. (https://courses.illinois.edu/schedule/terms/STAT/429/)
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. (https://courses.illinois.edu/schedule/terms/STAT/430/)
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 in the same or separate terms if topics vary. Prerequisite: STAT 410; STAT 425. Some topics may require additional prerequisites. Read the section text for each topic.

STAT 431  Applied Bayesian Analysis  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/431/)
Introduction to the concepts and methodology of Bayesian statistics, for students with fundamental knowledge of mathematical statistics. Topics include Bayes' rule, prior and posterior distributions, conjugacy, Bayesian point estimates and intervals, Bayesian hypothesis testing, noninformative priors, practical Markov chain Monte Carlo, hierarchical models and model graphs, and more advanced topics as time permits. Implementations in R and specialized simulation software. Same as ASRM 453. 3 undergraduate hours. 4 graduate hours. Prerequisite: STAT 410 and knowledge of R.
Information listed in this catalog is current as of 09/2022
STAT 527  Advanced Regression Analysis  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/527/)
An advanced introduction to regression analysis with applications to analyzing data from disciplines such as biostatistics and economics. The course will introduce classical as well as modern regression methods and goes into the depths of those techniques to understand the motivation, justification, implementation of those methods. An emphasis will be given to understand the statistical properties of those methods along with their practical advantages and limitations. Both theoretical and applied aspects of regression analysis will be discussed. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 510 or STAT 511 (concurrent enrollment is sufficient), and knowledge of R. For Graduate Students Only.

STAT 528  Advanced Regression Analysis II  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/528/)
An advanced (graduate-level) introduction to generalized linear models and categorical data analysis with applications to analyzing data from disciplines such as biostatistics, economics, evolutionary biology, and medicine. The course will introduce classical techniques as well as modern methods. A strong emphasis will be placed on statistical properties of presented methods as well as data analysis practice and critical statistical thinking. Practical advantages, limitations, and comparisons of methods will be discussed. 4 graduate hours. No professional credit. Prerequisite: STAT 510 or STAT 511, STAT 527. Restricted to graduate students only.

STAT 530  Bioinformatics  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/530/)
Same as ANSC 543, CHBE 571, and MCB 571. See CHBE 571.

STAT 532  Advanced Stochastic Processes  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/532/)
A nonmeasure theoretic introduction of stochastic processes. Students with suitable background in probability theory, real analysis and linear algebra are welcome to attend. Some classical topics will be included, such as discrete time Markov chains, continuous time Markov chains, Martingales, Renewal processes and Brownian motion. Students will learn some basic theory of stochastic processes, and their applications in several areas, including Queueing theory, Risk theory and Statistics. Students will also learn some probabilistic intuition and insights in thinking about problems, and some basic tools in the theoretical investigation of stochastic phenomenon and models. 4 graduate hours. No professional credit. Prerequisite: MATH 540, MATH 415 and MATH 461.

STAT 534  Advanced Survival Analysis  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/534/)
Introduction to the analysis of time-to-event outcomes. Topics include censoring, discrete survival, parametric models, nonparametric one- and K-sample methods, Cox regression, regression diagnostics, time-dependent covariates, and multivariate survival outcomes. Emphasis on key underlying concepts. Counting process-based theoretical justification and practical implementation will also be discussed. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 425, and knowledge of R.

STAT 538  Clinical Trials Methodology  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/538/)
The topics of the course focus on clinical trials designs and inferential techniques that are commonly used in the pharmaceutical industry. Topics include fixed sample designs for normal and survival data, two-sided group sequential design, Pocock's and O'Brien-Fleming boundaries, general theory of group sequential design, alpha and beta spending functions, one-sided designs with early stopping to accept the null hypothesis, non-inferiority designs, and inferential techniques. Computing in SAS will be emphasized. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 425, and familiarity with SAS.

STAT 541  Advanced Predictive Analytics  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/541/)
Same as ASRM 555. See ASRM 555.

STAT 542  Statistical Learning  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/542/)
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 ASRM 551 and CSE 542. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 425, and knowledge of R.

STAT 543  Appl. Multivariate Statistics  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/543/)
Same as CPSC 543. See CPSC 543.

STAT 545  Spatial Statistics  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/545/)
Theory and methods for analyzing univariate and multivariate spatial and spatio-temporal data. Covers both fundamental theories and cutting-edge research advances for geostatistics, and statistical methods for aggregated data and point processes. Real data examples will be provided in class and statistical software will be used to illustrate the data analysis. 4 graduate hours. No professional credit. Prerequisite: STAT 425 or equivalent.

STAT 546  Machine Learning in Data Science  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/546/)
Trains students to analyze large complex data using advanced statistical learning methods and algorithms. The main topics in the course include: data exploration and interpretation in data science; large data processing; regularization methods; optimization tools; deep learning; recommender systems; network and graphical models; text mining; and imaging analyses. Students will gain practical skills of data mining and knowledge discovery in various applications such as business, political science, biology and medicine. 4 graduate hours. No professional credit. Prerequisite: STAT 425; STAT 510 or STAT 511.

STAT 551  Theory of Probability I  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/551/)
Same as MATH 561. See MATH 561.

STAT 552  Theory of Probability II  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/552/)
Same as MATH 562. See MATH 562.
STAT 599  Thesis Research  credit: 0 to 16 Hours. (https://courses.illinois.edu/schedule/terms/STAT/599/)
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 598  Covar Struct and Factor Models  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/STAT/588/)
Same as EPSY 588, PSYC 588, and SOC 588. See PSYC 588.

STAT 590  Individual Study and Research  credit: 0 to 8 Hours. (https://courses.illinois.edu/schedule/terms/STAT/590/)
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. (https://courses.illinois.edu/schedule/terms/STAT/593/)
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. (https://courses.illinois.edu/schedule/terms/STAT/595/)
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. (https://courses.illinois.edu/schedule/terms/STAT/599/)
Approved for S/U grading only. May be repeated. Prerequisite: Consent of instructor.