STATISTICS (STAT)

STAT 301-1 Data Science 1 with R (1 Unit)
First course in Data Science, with focus on data management, manipulation, and visualization skills and techniques for exploratory data analysis. The course also introduces the R programming language in the context of Data Science. Students may not receive credit for both this course and STAT 303-1.
Prerequisite: STAT 202-0 or STAT 210-0 or consent of the instructor.
Formal Studies Distro Area

STAT 301-2 Data Science 2 with R (1 Unit)
Introduction to supervised machine/statistical learning with a focus on application using R. Course covers essential concepts in machine learning while surveying standard machine learning models such as linear and logistic regression. Course provides a foundation for learning more machine learning methods. Students may not receive credit for both this course and STAT 303-2.
Prerequisite: STAT 301-1 or consent of instructor.
Formal Studies Distro Area

STAT 301-3 Data Science 3 with R (1 Unit)
An intermediate course that covers machine learning methods in R, including supervised and unsupervised learning. It provides the knowledge and skills necessary to tackle real world problems with machine learning. Students may not receive credit for both this course and STAT 303-3.
Prerequisite: STAT 301-2 or consent of the instructor.
Formal Studies Distro Area

STAT 302-0 Data Visualization (1 Unit)
Introduction to the knowledge, skills, and tools required to visualize data of various formats across statistical domains and to create quality visualizations for both data exploration and presentation.
Prerequisite: STAT 202-0 or equivalent.
Formal Studies Distro Area

STAT 303-1 Data Science 1 with Python (1 Unit)
First course in Data Science, with focus on data management, manipulation, and visualization skills and techniques for exploratory data analysis. The course also introduces the Python programming language in the context of Data Science. Students may not receive credit for both this course and STAT 301-1.
Prerequisite: STAT 202-0 or STAT 210-0 or consent of the instructor.
Formal Studies Distro Area

STAT 303-2 Data Science 2 with Python (1 Unit)
Introduction to supervised machine/statistical learning with a focus on application using Python. Course covers essential concepts in machine learning while surveying standard machine learning models such as linear and logistic regression. Course provides a foundation for learning more machine learning methods. Students may not receive credit for both this course and STAT 301-2.
Prerequisite: STAT 303-1 or consent of the instructor.
Formal Studies Distro Area

STAT 303-3 Data Science 3 with Python (1 Unit)
An intermediate course that covers machine learning methods in Python, including supervised and unsupervised learning. It provides the knowledge and skills necessary to tackle real world problems with machine learning. Students may not receive credit for both this course and STAT 301-3.
Prerequisite: STAT 303-2 or consent of the instructor.
Formal Studies Distro Area

STAT 303-2 Data Science 2 with Python (1 Unit)
Introduction to supervised machine/statistical learning with a focus on application using Python. Course covers essential concepts in machine learning while surveying standard machine learning models such as linear and logistic regression. Course provides a foundation for learning more machine learning methods. Students may not receive credit for both this course and STAT 301-2.
Prerequisite: STAT 303-1 or consent of the instructor.
Formal Studies Distro Area

STAT 303-3 Data Science 3 with Python (1 Unit)
An intermediate course that covers machine learning methods in Python, including supervised and unsupervised learning. It provides the knowledge and skills necessary to tackle real world problems with machine learning. Students may not receive credit for both this course and STAT 301-3.
Prerequisite: STAT 303-2 or consent of the instructor.
Formal Studies Distro Area

STAT 344-0 Statistical Computing (1 Unit)
Exploration of theory and practice of computational statistics with emphasis on statistical programming in R.
Prerequisite: STAT 320-2 or equivalent.
Formal Studies Distro Area

STAT 345-0 Statistical Demography (1 Unit)
Introduction to statistical theory of demographic rates (births, deaths, migration) in multistate setting; statistical models underlying formal demography; analysis of error in demographic forecasting.
Prerequisite: STAT 350-0, MATH 240-0, or equivalent.
Formal Studies Distro Area

STAT 348-0 Applied Multivariate Analysis (1 Unit)
Statistical methods for describing and analyzing multivariate data. Principal component analysis, factor analysis, canonical correlation, clustering. Emphasis on statistical and geometric motivation, practical application, and interpretation of results.
Prerequisites: STAT 320-2, MATH 240-0, and STAT 350-0.
Formal Studies Distro Area

STAT 350-0 Regression Analysis (1 Unit)
Simple linear regression and correlation, multiple regression, residual analysis, model building, variable selection, multi-collinearity and shrinkage estimation, nonlinear regression. Prerequisite or co-requisite: STAT 320-1.
Formal Studies Distro Area

STAT 351-0 Design and Analysis of Experiments (1 Unit)
Methods of designing experiments and analyzing data obtained from them: one-way and two-way layouts, incomplete block designs, factorial designs, random effects, split-plot and nested designs.
Prerequisite: STAT 320-1 or equivalent.
Formal Studies Distro Area

STAT 352-0 Nonparametric Statistical Methods (1 Unit)
Survey of nonparametric methods, with emphasis on understanding their application. Estimation of a distribution function, density estimation, and nonparametric regression.
Prerequisite: STAT 350-0.
Formal Studies Distro Area

STAT 353-0 Advanced Regression (1 Unit)
This course covers modern regression methods, including: (1) generalized linear models (binary, categorical, and count data), (2) random effects, mixed effects, and nonlinear models, and (3) model selection. The course emphasizes both the theoretical development of the methods, as well as their application, including the communication of models and results both verbally and in writing.
Prerequisites: STAT 320-2 or 420-2 or MATH 310-2 and a first course in linear regression, residual analysis, model building, variable selection, multi-collinearity and shrinkage estimation, nonlinear regression. Prerequisite or co-requisite: STAT 320-1.
Formal Studies Distro Area

STAT 355-0 Analysis of Qualitative Data (1 Unit)
Introduction to the analysis of qualitative data. Measures of association, loglinear models, logits, and probits.
Prerequisite: STAT 320-2 or equivalent.
Formal Studies Distro Area

STAT 356-0 Hierarchical Linear Models (1 Unit)
Introduction to the theory and application of hierarchical linear models. Two and three level linear models, hierarchical generalized linear models, and application of hierarchical models to organizational research and growth models.
Prerequisites: STAT 320-2, STAT 350-0.
Formal Studies Distro Area

STAT 357-0 Introduction to Bayesian Statistics (1 Unit)
Introduction to basic concepts and principles in Bayesian inference such as the prior, likelihood, posterior and predictive distributions, as well as an introduction to a variety of computational algorithms for Bayesian inference. Students learn how to develop, describe, implement and critique statistical models from a Bayesian perspective.
Prerequisites: STAT 320-1, STAT 320-2, STAT 301-2 or 350-0, or consent of instructor.
Formal Studies Distro Area

STAT 359-0 Topics in Statistics (1 Unit)
Topics in theoretical and applied statistics to be chosen by instructor.
Prerequisite: consent of instructor.
Formal Studies Distro Area

STAT 365-0 Introduction to the Analysis of Financial Data (1 Unit)
Prerequisites: STAT 320-3, MATH 240-0.
Formal Studies Distro Area

STAT 370-0 Human Rights Statistics (1 Unit)
Development, analysis, interpretation, use, and misuse of statistical data and methods for description, evaluation, and political action regarding war, disappearances, justice, violence against women, trafficking, profiling, elections, hunger, refugees, discrimination, etc.
Prerequisites: Two of STAT 325-0, STAT 350-0, STAT 320-2, STAT 320-3; or ECON 381-1, ECON 381-2; or MATH 386-1, MATH 386-2; or IEMS 303-0, IEMS 304-0.
Formal Studies Distro Area

STAT 415-0 Introduction to Machine Learning (1 Unit)
This course is for students doing advanced studies in statistics and certain other fields will provide an introduction to modern machine learning methods. Topics include supervised learning, sparsity, logistic regression, SVM, kernel methods, deep learning, unsupervised learning, and real world problems including fairness and interpretability of black box models. Not for data science majors/minors - students studying data science should take STAT 3-0 instead.
Prerequisites: Math 240-0, Math 230-2, and STAT 320-2 or statistics graduate standing.

STAT 420-1 Introduction to Statistical Theory & Methodology-1 (1 Unit)
First Quarter: Distribution theory, characteristic functions, moments and cumulants, random variables, sampling theory, and common statistical distributions. Second Quarter: Methods of estimation, hypothesis tests, confidence intervals, least squares, likelihood methods, and large-sample methods. Third Quarter: Normal linear models and its various extensions.

STAT 420-2 Introduction to Statistical Theory & Methodology-2 (1 Unit)
First Quarter: Distribution theory, characteristic functions, moments and cumulants, random variables, sampling theory, and common statistical distributions. Second Quarter: Methods of estimation, hypothesis tests, confidence intervals, least squares, likelihood methods, and large-sample methods. Third Quarter: Normal linear models and its various extensions.

STAT 420-3 Introduction to Statistical Theory & Methodology-3 (1 Unit)
First Quarter: Distribution theory, characteristic functions, moments and cumulants, random variables, sampling theory, and common statistical distributions. Second Quarter: Methods of estimation, hypothesis tests, confidence intervals, least squares, likelihood methods, and large-sample methods. Third Quarter: Normal linear models and its various extensions.

STAT 425-0 Sampling Theory and Applications (1 Unit)
Sampling designs (simple random, unequal probability, stratified, cluster, systematic, random walk, induced, multiphase, choosing sample sizes), sample adjustment (weighting/calibration), variance estimation, non-sampling errors, topics re government statistical agencies.
Prerequisites: Two previous courses in probability and statistics, at least one at the 300 level in Statistics (other than STAT 330-1, STAT 330-2), Econometrics, IE/MS, Math; or permission of instructor.

STAT 430-1 Probability for Statistical Inference 1 (1 Unit)
Foundations of measure theoretic probability, with applications to
statistics.
Prerequisites: MATH 320-1 and STAT 420-1.

STAT 430-2 Probability for Statistical Inference 2 (1 Unit)
A second course in measure theoretic probability, with applications to
statistics. Topics include convergence of sequences of random variables
and distributions, conditional expectation, martingales, heavy tails, and
extreme value theory.
Prerequisite: STAT 430-1.

STAT 435-0 Mathematical Foundations of Machine Learning (1 Unit)
In this course, students are expected to explore some mathematical
foundations of modern machine learning under a problem-solving
framework. Topics include probability theory, frequentist statistics,
Bayesian statistics, tensor algebra, vector calculus, convex and
stochastic optimization, stochastic processes and sampling, Markov
Chain Monte Carlo, sequential optimization and dynamic programming.
This class strongly emphasizes on developing problem-solving skills.
Prerequisite: 420-1(recommended but not required).

STAT 439-0 Meta-Analysis (1 Unit)
Statistical methods for combining results of replicated experiments.
Effect size indexes and their estimators, combined estimation and test of
heterogeneity, modeling between-study variation in effect sizes, models
for publication selection.
Prerequisite: A graduate-level course in statistics.

STAT 440-0 Applied Stochastic Processes for Statistics (1 Unit)
In this course, students are expected to learn statistical applications
of stochastic processes. Topics may include Markov, martingales,
Brownian, other statistical applications. An integral part will be the
student presentations on related topics.
Prerequisites: STAT 420-1, STAT 420-2, STAT 420-3, STAT 430-1, and
STAT 430-2.

STAT 448-0 Multivariate Statistical Methods (1 Unit)
Multivariate normal distribution, Hotelling’s T2-test, multivariate analysis
of variance, discriminant analysis, canonical correlation, principal
components, and factor analysis. Use of computer packages.

STAT 451-0 Design & Analysis of Social Experiments (1 Unit)
This course covers the design and analysis of social experiments
conducted in field settings. It will focus on experiments based on
samples from populations with hierarchical structure and experiments
that involve randomization of intact groups (statistical clusters) to
treatments. Design and analysis considerations will be covered in detail,
and students will carry out exercises in the design and analysis of social
experiments in realistic settings.
Prerequisite: Permission of the instructor.

STAT 453-0 Survival Analysis (1 Unit)
Life-table construction, Kaplan-Meier estimation, exponential survival
distributions, Weibull distributions, and Cox regression models.

STAT 454-0 Time Series Analysis (1 Unit)
Harmonic analysis, power spectra, filtering, cross-spectra, linear
processes, and forecasting.

STAT 455-0 Advanced Qualitative Data Analysis (1 Unit)
Probit, logit, log-linear, and latent-class models. Multi-dimensional
contingency tables; polynomous responses with continuous independent
variables.
Prerequisites: STAT 350-0 and STAT 420-3.

STAT 456-0 Generalized Linear Models (1 Unit)
Inference and fitting of generalized linear models with application to
classical linear models, binomial and multinomial logit models, log-linear
models, Cox’s proportional hazards model and GEE’s for longitudinal data.
Prerequisites: STAT 350-0 and STAT 420-3.

STAT 457-0 Applied Bayesian Inference (1 Unit)
Introduction to computational algorithms for Bayesian inference.
Observed data and data augmentation methods are considered in detail.
Methods are illustrated with real examples.
Prerequisites: STAT 350-0 and STAT 420-1 and STAT 420-2 and
STAT 420-3 or equivalent or students who have earned a Master’s degree
in Statistics or permission of the instructor.

STAT 461-0 Advanced Topics in Statistics (1 Unit)

STAT 465-0 Statistical Methods for Bioinformatics and Computational
Biology (1 Unit)
An introduction of statistical methodologies in cutting-edge fields of
computational biology and bioinformatics topics including microarray
gene expression data analysis; biological sequence analysis; EST and
SAGE data analysis.

STAT 466-0 Likelihood Methods (1 Unit)
Recent results in the theory of likelihood-based inference. Topics covered
will include higher-order asymptotic theory, based both on Edgeworth
expansions and saddlepoint methods, conditional and marginal likelihood
functions, the modified profile likelihood function and adjustments to the
signed likelihood ratio statistic.
Prerequisite: STAT 420-2.

STAT 498-0 Advanced Practicum (1 Unit)
Supervised statistical consultation.

STAT 499-0 Independent Study (1-3 Units)
SEE DEPT FOR SECTION AND PERMISSION NUMBERS.

STAT 519-0 Responsible Conduct of Research Training (0 Unit)

STAT 590-0 Research (1-3 Units)
SEE DEPT FOR SECTION AND PERMISSION NUMBERS.