STAT 401. Introduction to Probability. 3 or 4 hours.
Probability spaces, random variables and their distributions, conditional
distribution and stochastic independence, special distributions, sampling
distributions, limit theorems. Course Information: 3 undergraduate hours.
4 graduate hours. Prerequisite(s): Grade of C or better in MATH 210; or
approval of the department.

STAT 411. Statistical Theory. 3 or 4 hours.
Estimation, tests of statistical hypotheses, best tests, sufficient statistics,
Rao-Cramer inequality, sequential probability ratio tests, the multivariate
normal distribution, nonparametric methods. Course Information: 3
undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or
better in STAT 401.

STAT 416. Nonparametric Statistical Methods. 3 or 4 hours.
Distribution free tests for location and dispersion problems, one-
way and two-way layouts, the independence problem, regression
problems involving slopes, detecting broad alternatives, resampling
methods. Course Information: 3 undergraduate hours. 4 graduate hours.
Prerequisite(s): Grade of C or better in STAT 381 or STAT 411.

STAT 431. Introduction to Survey Sampling. 3 or 4 hours.
Simple random sampling; sampling proportions; estimation of sample
size; stratified random sampling; ratio estimators; regression estimators;
systematic and cluster sampling. Course Information: 3 undergraduate
hours. 4 graduate hours. Prerequisite(s): Grade of C or better in STAT
411 or STAT 481.

STAT 451. Computational Statistics. 3 or 4 hours.
Modern computationally-intensive statistical methods including
Monte Carlo integration and simulation, optimization and maximum
likelihood estimation, EM algorithm, MCMC, sampling and resampling
methods, non-parametric density estimation. Course Information:
3 undergraduate hours. 4 graduate hours. Extensive computer use
required. Prerequisite(s): STAT 411.

STAT 461. Applied Probability Models I. 3 or 4 hours.
Computing probabilities and expectations by conditioning, Markov
chains, Chapman-Kolmogorov equations, branching processes, Poisson
processes and exponential distribution, continuous-time Markov chains,
reversibility, uniformization. Course Information: 3 undergraduate hours.
4 graduate hours. Prerequisite(s): Grade of C or better in STAT
411 or STAT 481.

STAT 471. Linear and Non-Linear Programming. 3 or 4 hours.
Linear programming, simplex algorithm, degeneracy, duality theorem
sensitivity analysis, convexity, network simplex methods, assignment
problems. Constrained and unconstrained minima. Quasi-Newton
methods. Ellipsoidal methods of Kachian. Course Information: 3
undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or
better in MATH 310.

STAT 473. Game Theory. 3 or 4 hours.
Introduction to the basic ideas of game theory. Static and dynamic
games; mixed strategies, imperfect information; economic, political and
biological applications. Course Information: Same as ECON 473. 3
undergraduate hours. 4 graduate hours. Prerequisite(s): STAT 381; or
ECON 270; or equivalents.

STAT 475. Mathematics and Statistics for Actuarial Sciences I. 3 or 4
hours.
Financial mathematics as it pertains to the valuation of deterministic
cash flows. Basic concepts and techniques regarding the theory of
interest. Course Information: 3 undergraduate hours. 4 graduate hours.
Prerequisite(s): Math 210.

STAT 481. Applied Statistical Methods II. 3 or 4 hours.
Testing hypotheses, linear regression, generalized linear models,
analysis of variance, factorial design, and nested design. SAS and R
applications. Course Information: 3 undergraduate hours. 4 graduate
hours. Prerequisite(s): Grade of C or better in STAT 381; or consent
of the instructor. Students in the BS in Data Science may satisfy the
prerequisite with C or better in IE 342 or ECE 341 instead of STAT 381.

STAT 485. Intermediate Statistical Techniques for Machine Learning
and Big Data. 3 or 4 hours.
Modern techniques for statistical learning including linear models,
subset selection, partial least squares; LDA; logistic regression; model
selection; sampling theory with applications to big data analysis; applied
nonparametric inference. Course Information: 3 undergraduate hours.
4 graduate hours. Extensive computer use required. Prerequisite(s): STAT
385 and STAT 411. Recommended background: STAT 481.

STAT 486. Statistical Consulting. 3 or 4 hours.
Introduction to statistical consulting methods and techniques. Handling
and transformation of raw data sets in CMS. Statistical analysis of data
sets with SAS and SPSSX. Course Information: 3 undergraduate hours.
4 graduate hours. Prerequisite(s): Grade of C or better in STAT 411 or
STAT 481.

STAT 494. Special Topics in Statistics, Probability and Operations
Research. 3 or 4 hours.
Course content announced prior to each semester in which it is
given. Topics drawn from areas such as distribution theory; Bayesian
inference; discrete optimization; applied probability models; resampling
techniques; biostatistics; environmental sampling. Course Information:
3 undergraduate hours. 4 graduate hours. May be repeated. Students may
register in more than one section per term. Prerequisite(s): Approval of
the department.

STAT 496. Independent Study. 1-4 hours.
Reading course supervised by a faculty member. Course Information:
May be repeated. Students may register in more than one section per
term. Prerequisite(s): Approval of the instructor and approval of the
department.

STAT 501. Probability Theory I. 4 hours.
Abstract measure theory, probability measure, random variables,
Lebesgue integration and expectation, and convergence of random
variables. Course Information: Prerequisite(s): MATH 414 or consent
of the instructor.

STAT 502. Probability Theory II. 4 hours.
Radon-Nikodym theorem, conditional expectations, martingales,
stationary processes, ergodic theorem, stationary Gaussian processes,
Markov chains, introduction to stochastic processes, Brownian motions.
Course Information: Prerequisite(s): STAT 501.

STAT 511. Advanced Statistical Theory I. 4 hours.
Statistical models, criteria of optimum estimation, large sample
theory, optimum tests and confidence intervals, best unbiased tests in
exponential families, invariance principle, likelihood ratio tests. Course
Information: Prerequisite(s): STAT 411.
STAT 512. Advanced Statistical Theory II. 4 hours.
Basic concepts in decision theory, prior and posterior distributions, Bayesian decision theory, hierarchical models, robustness, minimax analysis, invariance principle, sequential analysis, completeness. Course Information: Prerequisite(s): STAT 511.

STAT 521. Linear Statistical Inference. 4 hours.
Estimation and testing in linear models, generalized inverses of matrices, n-dimensional normal distribution, quadratic forms, likelihood ratio tests, best invariant tests, analysis of variance. Course Information: Prerequisite(s): STAT 411.

STAT 522. Multivariate Statistical Analysis. 4 hours.
Multivariate normal distribution, estimation of mean vector and covariance matrix, T-square statistic, discriminant analysis, general linear hypothesis, principal components, canonical correlations, factor analysis. Course Information: Prerequisite(s): STAT 521.

STAT 531. Sampling Theory I. 4 hours.
Foundations of survey design and inference for finite populations; the Horvitz-Thompson estimator; simple random, cluster, systematic survey designs; auxiliary size measures in design and inference. Course Information: Prerequisite(s): STAT 411.

STAT 532. Sampling Theory II. 4 hours.
Uses of auxiliary size measures in survey sampling; cluster sampling; systematic sampling; stratified sampling; superpopulation methods; randomized response methods; resampling; nonresponse; small area estimations. Course Information: Prerequisite(s): STAT 531.

STAT 535. Optimal Design Theory I. 4 hours.
Gauss-Markov theorem; optimality criteria; optimal designs for 1-way, 2-way elimination of heterogeneity models; repeated measurements, treatment-control; Equivalence theorem; approximate designs for polynomial regression. Course Information: Prerequisite(s): STAT 521.

STAT 536. Optimal Design Theory II. 4 hours.
Construction of optimal designs; BIB, Latin square and generalized Youden, repeated measurements, treatment-control studies; construction of factorial designs including orthogonal arrays Course Information: Prerequisite(s): STAT 535 or consent of the instructor.

STAT 585. Advanced Statistical Techniques for Machine Learning and Big Data. 4 hours.
Cutting-edge data analysis techniques including regularization methods; ensemble learning; dimension reduction; network and graphics; recommender system; text mining; deep learning; imaging analysis; object-oriented data analysis. Course Information: Extensive computer use required. Prerequisite(s): Grade of C or better in STAT 485 or consent of the instructor.

Special topics. Topics drawn from areas such as: Data analysis; Bayesian inference; Nonlinear models; Time series; Computer aided design; reliability models; game theory. Course Information: May be repeated. Prerequisite(s): Approval of the department.

STAT 593. Graduate Student Seminar. 1 hour.
For graduate students who wish to receive credit for participating in a learning seminar whose weekly time commitment is not sufficient for a reading course. This seminar must be sponsored by a faculty member. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Students may register in more than one section per term. Prerequisite(s): Approval of the department.