STAT - STATISTICS AND PROBABILITY

STAT400 Applied Probability and Statistics I (3 Credits)
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141); or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: BMGT231, ENEE324, or STAT400.
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT401 Applied Probability and Statistics II (3 Credits)
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410).
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT410 Introduction to Probability Theory (3 Credits)
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with SURV410.
Credit Only Granted for: STAT410 or SURV410.

STAT420 Theory and Methods of Statistics (3 Credits)
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with SURV410.
Credit Only Granted for: STAT410 or SURV410.

STAT426 Introduction to Data Science and Machine Learning (3 Credits)
An introductory course to the recent developments in the fields of data science and machine learning. Emphasis will be given to mathematical and statistical understanding of commonly used methods and processes.
Prerequisite: Minimum grade of C- in MATH241 or MATH340; and minimum grade of C- in MATH240, MATH461 or MATH341; and minimum grade of C- in STAT400 or STAT410; students who have taken courses with content comparable to STAT400/410 may request permission of the instructor.
Credit Only Granted for: STAT426 or CMS320.

STAT430 Introduction to Statistical Computing with SAS (3 Credits)
Descriptive and inferential statistics. SAS software: numerical and graphical data summaries; merging, sorting and splitting data sets. Least squares, regression, graphics and informal diagnostics, interpreting results. Categorical data, lifetime data, time series. Applications to engineering, life science, business and social science.
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410).

STAT440 Sampling Theory (3 Credits)
Prerequisite: 1 course with a minimum grade of C- from (STAT401, STAT420).
Credit Only Granted for: STAT440 or SURV440.

STAT464 Introduction to Biostatistics (3 Credits)
Prerequisite: Must have completed one semester of calculus.
Restriction: Junior standing or higher.
Credit Only Granted for: BIO372 or STAT464.
Additional Information: Not acceptable toward degrees in MATH/STAT.

STAT470 Actuarial Mathematics (3 Credits)
Major mathematical ideas involved in calculation of life insurance premiums, including compound interest and present valuation of future income streams; probability distribution and expected values derived from life tables; the interpolation of probability distributions from values estimated at one-year multiples; the 'Law of Large Numbers' describing the regular probabilistic behavior of large populations of independent individuals; and the detailed calculation of expected present values arising in insurance problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Recommended: STAT400.

STAT498 Selected Topics in Statistics (1-6 Credits)
Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the MATH/STAT major committee. Students register for reading in statistics under this number.
Restriction: Permission of CMNS-Mathematics department.
Repeatable to: 16 credits.

STAT600 Probability Theory I (3 Credits)
Probability space; distribution functions and densities; Poisson limit theorem; de Moivre-Laplace theorem; measure-theoretic definition of expectation; classification of measures on R; convergence of random variables; Radon-Nikodym theorem; LP spaces; conditional probabilities; independence of events, sigma-algebras and random variables; Bayes' theorem; pi-systems and Dynkin systems; discrete Markov chains; random walks; gambler's ruin problem; Markov chains on a general phase space; Borel-cantelli lemmas; Kolmogorov inequality; three series theorem; laws of large numbers.
Prerequisite: STAT410.

STAT601 Probability Theory II (3 Credits)
Weak convergence of measures; characteristic functions; Central Limit Theorem and local limit theorem; stable laws; Kolmogorov consistency theorem (without proof); conditional expectations and martingales; optimal stopping theorem; convergence of martingales; Brownian motion; Markov processes and families; stochastic integral and Itô formula.
Prerequisite: STAT600.
STAT650 Applied Stochastic Processes (3 Credits)
Prerequisite: STAT410; or students who have taken courses with comparable content may contact the department.

STAT658 Advanced Applied Stochastic Processes II (3 Credits)
Advanced topics in applied stochastic processes, rotating among the headings of queueing theory, population processes, and regenerative phenomena. Course includes discussion of stochastic models and fields of application, Markov process theory including calculation and characterization of stationary distributions and diffusion approximations, renewal theory and Wiener-Hopf factorization theory.
Prerequisite: STAT650; and must have completed a graduate course in analysis. Or permission of instructor.
Recommended: STAT601 and STAT600.
Repeatable to: 6 credits if content differs.

STAT689 Research Interactions in Statistics (1-3 Credits)
The students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) research group. Format varies, but includes regular meetings, readings and presentations of material. See graduate program’s online syllabus or contact the graduate program director for more information.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

STAT700 Mathematical Statistics I (3 Credits)
Prerequisite: STAT410; or students who have taken courses with comparable content may contact the department.

STAT701 Mathematical Statistics II (3 Credits)
Prerequisite: STAT700; or students who have taken courses with comparable content may contact the department.

STAT702 Survival Analysis (3 Credits)
Concepts/definitions of survival functions, hazard rate or hazard function, cumulative hazard functions, mean residual life, inversion formulas; Parametric models: exponential distribution, Weibull distribution; Censored/incomplete data and real data examples; right censored data, doubly censored data, interval censored data, truncated data; Nonparametric maximal likelihood estimator for the lifetime distribution under different types of censoring (e.g., Kaplan-Meier estimator), self-consistency estimators, the EM algorithm, applications of the empirical likelihood; Semiparametric models: accelerated lifetime model, proportional hazard model, the Cox model; Goodness of fit tests and diagnostic methods for model checking.
Prerequisite: STAT410 and STAT420; or students who have taken courses with comparable content may contact the department; or permission of instructor.

STAT705 Computational Statistics (3 Credits)
Modern methods of computational statistics and their application to both practical problems and research. S-Plus and SAS programming with emphasis on S-Plus. S-Plus objects and functions, and SAS procedures. Topics include data management and graphics, Monte Carlo and simulation, bootstrapping, numerical optimization in statistics, linear and generalized linear models, nonparametric regression, time series analysis.
Prerequisite: STAT700 or STAT420.
Recommended: Have some programming experience (any language).
Credit Only Granted for: STAT705 or STAT798C.
Formerly: STAT798C.

STAT730 Time Series Analysis (3 Credits)
Prerequisite: STAT700; and must have completed a graduate course in analysis. Or permission of instructor.
Recommended: STAT701 and STAT650.

STAT740 Linear Statistical Models I (3 Credits)
Least squares, general linear models, estimability and Gauss-Markov theorem. Simple and multiple linear regression, analysis of residuals and diagnostics, polynomial models, variable selection. Qualitative predictors, one and two way analysis of variance, multiple comparisons, analysis of covariance. Nonlinear least squares. High-level statistical computer software will be used for data analysis throughout the course.
Prerequisite: STAT700 or STAT420.

STAT741 Linear Statistical Models II (3 Credits)
Continuation of STAT 740. Multiway layouts, incomplete designs, Latin squares, complete and fractional factorial designs, crossed and nested models. Balanced random effects models, mixed models, repeated measures. General mixed model, computational algorithms, ML and REML estimates. Generalized linear models, logistic and loglinear regression.
Prerequisite: STAT740.

STAT750 Multivariate Analysis (3 Credits)
Prerequisite: STAT700 or STAT420.

STAT770 Analysis of Categorical Data (3 Credits)
Loglinear and logistic models. Single classification, two-way classification; contingency tables; tests of homogeneity and independence models, measures of association, distribution theory. Bayesian methods. Incomplete contingency tables. Square contingency tables - symmetry. Extensions to higher dimensional contingency tables.
Prerequisite: STAT430 and STAT420; or permission of CMNS-Mathematics department.
STAT798 Selected Topics in Statistics (1-4 Credits)
STAT799 Master's Thesis Research (1-6 Credits)
STAT808 Selected Topics in Probability (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

STAT818 Selected Topics in Statistics (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

STAT898 Pre-Candidacy Research (1-8 Credits)
STAT899 Doctoral Dissertation Research (1-8 Credits)