Statistics Courses

Lower Division Courses

Only one lower division statistics course may be taken for credit.

2. Introduction to Statistics. (4) Students who have taken 2X, 5, 20, 21, 21X, or 25 will receive no credit for 2. Three hours of lecture and two hours of laboratory per week. Population and variables. Standard measures of location, spread and association. Normal approximation. Regression. Probability and sampling. Binomial distribution. Interval estimation. Some standard significance tests. (F,SP)

20. Introduction to Probability and Statistics. (4) Students who have taken 2, 2X, 5, 21, 21X, or 25 will receive no credit for 20. Three hours of lecture and two hours of laboratory per week. *Prerequisites: One semester of calculus*. For students with mathematical background who wish to acquire basic concepts. Relative frequencies, discrete probability, random variables, expectation. Testing hypotheses. Estimation. Illustrations from various fields. (F,SP)

21. Introductory Probability and Statistics for Business. (4) Students who have taken 2, 2X, 5, 20, 21X or 25 will receive no credit for 21. A deficency in N21 may be moved by taking 21. Three hours of lecture and two hours of laboratory per week. *Prerequisites: One semester of calculus*. Descriptive statistics, probability models and related concepts, sample surveys, estimates, confidence intervals, tests of significance, controlled experiments vs. observational studies, correlation and regression. (F,SP)

W21. Introductory Probability and Statistics for Business. (4) Students will receive no credit for Statistics W21 after taking Statistics 2, 20, or 25. Three hours of web-based lecture per week. *Prerequisites: One semester of calculus. Formerly N21.* Reasoning and fallacies, descriptive statistics, probability models and related concepts, combinatorics, sample surveys, estimates, confidence intervals, tests of significance, controlled experiments vs. observational studies, correlation and regression. (F,SP) *Staff*

39. Freshman/Sophomore Seminar. Course may be repeated for credit as topic varies. Sections 1-2 to be graded on a letter-grade basis. Sections 3-4 to be graded on a *passed/not passed* basis. *Prerequisites: Priority given to freshmen and sophomores*. Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.

39D. . (2-4) Two to four hours of seminar per week.

C79. Societal Risks and the Law. (3) Three hours of lecture and one hour of discussion per week. *Prerequisites: One semester of calculus*. Defining, perceiving, quantifying and measuring risk; identifying risks and estimating their importance; determining whether laws and regulations can protect us from these risks; examining how well existing laws work and how they could be improved; evaluting costs and benefits. Applications may vary by term. This course cannot be used to complete engineering unit or technical elective requirements for students in the College of Engineering. Also listed as Political Science C79 and Computer Science C79. (F,SP) *Sekhon, Stark, Wagner, Staff*

97. Field Study in Statistics. (1-3) Course may be repeated for credit. One to three hours of fieldwork per week. Must be taken on a *passed/not passed* basis. Supervised experience relevant to specific aspects of statistics in off-campus settings. Individual and/or group meetings with faculty. (F,SP)

98. Directed Group Study. (2) Two hours of group study per week. Must be taken on a *passed/not passed* basis. *Prerequisites: Consent of instructor*. Must be taken at the same time as either Statistics 2 or 21. This course assists lower division statistics students with structured problem solving, interpretation and making conclusions. (F,SP)

Upper Division Courses

131A-131B. Introduction to Probability and Statistics for Life Scientists. (4;4) Three hours of lecture and two hours of

laboratory per week. *Prerequisites: One semester of calculus or consent of instructor*. Ideas for estimation and hypothesis testing basic to applications, including an introduction to probability. Linear estimation and normal regression theory. (F,SP)

133. Concepts in Computing with Data. (3) Three hours of lecture and one hour of laboratory per week. An introduction to computationally intensive applied statistics. Topics will include organization and use of databases, visualization and graphics, statistical learning and data mining, model validation procedures, and the presentation of results. (F,SP)

134. Concepts of Probability. (3) Students will not receive credit for 134 after taking 101. Three hours of lecture per week. *Prerequisites: One year of calculus*. An introduction to probability, emphasizing concepts and applications. Conditional expectation, independence, laws of large numbers. Discrete and continuous random variables. Central limit theorem. Selected topics such as the Poisson process, Markov chains, characteristic functions. (F,SP)

135. Concepts of Statistics. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 134 and linear algebra (Mathematics 54 or equivalent). Statistics 133 strongly recommended*. A comprehensive survey course in statistical theory and methodology. Topics include descriptive statistics, maximum likelihood estimation, non-parametric methods, introduction to optimality, goodness-of-fit tests, analysis of variance, bootstrap and computer-intensive methods and least squares estimation. The laboratory includes computer-based data-analytic applications to science and engineering. (F,SP)

150. Stochastic Processes. (3) Three hours of lecture per week. *Prerequisites: 101 or 103A or 134*. Random walks, discrete time Markov chains, Poisson processes. Further topics such as: continuous time Markov chains, queueing theory, point processes, branching processes, renewal theory, stationary processes, Gaussian processes. (SP)

151A-151B. Linear Modelling: Theory and Applications. (4;4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: 102 or 135. 133 recommended*. A coordinated treatment of linear and generalized linear models and their application. Linear regression, analysis of variance and covariance, random effects, design and analysis of experiments, quality improvement, log-linear models for discrete multivariate data, model selection, robustness, graphical techniques, productive use of computers, in-depth case studies.

152. Sampling Surveys. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: 101 or 134. 133 and 135 recommended*. Theory and practice of sampling from finite populations. Simple random, stratified, cluster, and double sampling. Sampling with unequal probabilities. Properties of various estimators including ratio, regression, and difference estimators. Error estimation for complex samples.

153. Introduction to Time Series. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: 101, 134 or consent of instructor. 133 or 135 recommended*. An introduction to time series analysis in the time domain and spectral domain. Topics will include: estimation of trends and seasonal effects, autoregressive moving average models, forecasting, indicators, harmonic analysis, spectra.

154. Modern Statistical Prediction and Machine Learning. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Mathematics 53 and 54 or equivalents; Statistics 135 or equivalent; experience with some programming language. Mathematics 55 or equivalent exposure to counting arguments is recommended but not required*. Theory and practice of statistical prediction. Contemporary methods as extensions of classical methods. Topics: optimal prediction rules, the curse of dimensionality, empirical risk, linear regression and classification, basis expansions, regularization, splines, the bootstrap, model selection, classification and regression trees, boosting, support vector machines. Computational efficiency versus predictive performance. Emphasis on experience with real data and assessing statistical assumptions.

155. Game Theory. (3) Three hours of lecture per week. *Prerequisites: 101 or 134*. General theory of zero-sum, two-person games, including games in extensive form and continuous games, and illustrated by detailed study of examples. (F,SP)

157. Seminar on Topics in Probability and Statistics. (3) Course may be repeated for credit with consent of instructor. Three hours of seminar per week. *Prerequisites: Mathematics 53-54, Statistics 134, 135. Knowledge of scientific computing environment (R or Matlab) often required. Prerequisites might vary with instructor and topics*. Substantial student participation required. The topics to be covered each semester that the course may be offered will be announced by the middle of the preceding semester; see departmental bulletins. Recent topics include: Bayesian statistics, statistics and finance, random matrix theory, high-dimensional statistics.

158. The Design and Analysis of Experiments. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 134 and 135 or consent of instructor. Statistics 135 may be taken concurrently. Statistics 133 is recommended*. An

introduction to the design and analysis of experiments. This course covers planning, conducting, and analyzing statistically designed experiments with an emphasis on hands-on experience. Standard designs studied include factorial designs, block designs, latin square designs, and repeated measures designs. Other topics covered include the principles of design, randomization, ANOVA, response surface methodoloy, and computer experiments.

H195. Special Study for Honors Candidates. (1-4) Course may be repeated for credit. (F,SP)

197. Field Study in Statistics. (1-3) Course may be repeated for credit. Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog. One to three hours of fieldwork per week. Must be taken on a *passed/not passed* basis. Supervised experience relevant to specific aspects of statistics in off-campus settings. Individual and/or group meetings with faculty. (F,SP)

198. Directed Study for Undergraduates. (1-3) Course may be repeated for credit. Must be taken on a *passed/not passed* basis. *Prerequisites: Consent of instructor*. Special tutorial or seminar on selected topics. (F,SP)

199. Supervised Independent Study and Research. (1-3) Course may be repeated for credit. Must be taken on a *passed/not passed* basis. (F,SP) *Staff*

Graduate Courses

200A-200B. Introduction to Probability and Statistics at an Advanced Level. (4;4) Students will receive no credit for Statistics 200A-200B after taking Statistics 201A-201B. Three hours of lecture and two hours of laboratory per week. *Prerequisites: Multivariable calculus and one semester of linear algebra*. Probability spaces, random variables, distributions in probability and statistics, central limit theorem, Poisson processes, transformations involving random variables, estimation, confidence intervals, hypothesis testing, linear models, large sample theory, categorical models, decision theory. (F,SP)

201A. Introduction to Probability at an Advanced Level. (4) Students will receive no credit for 201A after taking 200A. Six hours of lecture and three hours of laboratory for seven weeks. *Prerequisites: Multivariable calculus, one semester of linear algebra, and Statistics 134 or consent of instructor*. Distributions in probability and statistics, central limit theorem, Poisson processes, modes of convergence, transformations involving random variables. (F) *Staff*

201B. Introduction to Statistics at an Advanced Level. (4) Students will receive no credit for 201B after taking 200B. Six hours of lecture and three hours of laboratory for seven weeks. *Prerequisites: Statistics 200A, Statistics 201A, or consent of instructor*. Estimation, confidence intervals, hypothesis testing, linear models, large sample theory, categorical models, decision theory. (F) *Staff*

204. Probability for Applications. (4) Students will receive no credit for 204 after taking 205A-205B. Three hours of lecture per week. A treatment of ideas and techniques most commonly found in the applications of probability: Gaussian and Poisson processes, limit theorems, large deviation principles, information, Markov chains and Markov chain Monte Carlo, martingales, Brownian motion and diffusion. (F) *Evans*

C205A. Probability Theory. (4) Three hours of lecture per week. The course is designed as a sequence with Statistics C205B/Mathematics C218B with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion. Also listed as Mathematics C218A. *Staff*

C205B. Probability Theory. (4) Three hours of lecture per week. The course is designed as a sequence with with Statistics C205A/Mathematics C218A with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale converengence theorems. Markov chains. Stationary processes. Brownian motion. Also listed as Mathematics C218B. *Staff*

C206A. Advanced Topics in Probability and Stochastic Process. (3) Course may be repeated for credit with a different instructor. Three hours of lecture per week. *Prerequisites: Statistics C205A-C205B/Mathematics C218A-218B or consent of instructor*. The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probabilty offered according to students demand and faculty availability. Also listed as Mathematics C223A. (F,SP) *Staff*

C206B. Advanced Topics in Probablity and Stochastic Processes. (3) Course may be repeated for credit with a different instructor. Three hours of lecture per week. *Prerequisites: Statistics C205A-C205B/Mathematics C218A-C218B or consent of instructor*. The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probablity offered according to students demand and faculty availability. Also listed as Mathematics C223B. (F,SP) *Staff*

210A. Theoretical Statistics. (4) Three hours of lecture per week. *Prerequisites: Linear algebra, real analysis, and a year of upper division probability and statistics*. An introduction to mathematical statistics, covering both frequentist and Bayesian aspects of modeling, inference, and decision-making. Topics include statistical decision theory; point estimation; minimax and admissibility; Bayesian methods; exponential families; hypothesis testing; confidence intervals; small and large sample theory; and M-estimation. (F,SP)

210B. Theoretical Statistics. (4) Three hours of lecture per week. *Prerequisites: Statistics 210A and a graduate level probability course; a good understanding of various notions of stochastic convergence*. Introduction to modern theory of statistics; empirical processes, influence functions, M-estimation, U and V statistics and associated stochastic decompositions; non-parametric function estimation and associated minimax theory; semiparametric models; Monte Carlo methods and bootstrap methods; distributionfree and equivariant procedures; topics in machine learning. Topics covered may vary with instructor. (F)

212A-212B. Topics in Theoretical Statistics. (3;3) Course may be repeated for credit with different instructor. Three hours of lecture per week. *Prerequisites: 210 or 205 and 215*. This course introduces the student to topics of current research interest in theoretical statistics. Recent topics include information theory, multivariate analysis and random matrix theory, high-dimensional inference. Typical topics have been model selection; empirical and point processes; the bootstrap, stochastic search, and Monte Carlo integration; information theory and statistics; semi- and non-parametric modeling; time series and survival analysis.

215A. Statistical Models: Theory and Application. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Linear algebra, calculus, upper division probability and statistics, and familiarity with high-level programming languages. Statistics 133, 134, and 135 recommended*. Applied statistics with a focus on critical thinking, reasoning skills, and techniques. Hands-on-experience with solving real data problems with high-level programming languages such as R. Emphasis on examining the assumptions behind standard statistical models and methods. Exploratory data analysis (e.g., graphical data summaries, PCAs, clustering analysis). Model formulation, fitting, and validation and testing. Linear regression and generalizations (e.g., GLMs, ridge regression, lasso). (F,SP)

215B. Statistical Models: Theory and Application. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 215A or consent of instructor*. Course builds on 215A in developing critical thinking skills and the techniques of advanced applied statistics. Particular topics vary with instructor. Examples of possible topics include planning and design of experiments, ANOVA and random effects models, splines, classification, spatial statistics, categorical data analysis, survival analysis, and multivariate analysis. (F,SP)

222. Masters of Statistics Capstone Project. (4) Four hours of seminar per week. *Prerequisites: Statistics 201A-201B, 243. Restricted to students who have been admitted to the one-year Masters Program in Statistics beginning fall 2012 or later*. The capstone project is part of the masters degree program in statistics. Students engage in professionally-oriented group research under the supervision of a research advisor. The research synthesizes the statistical, computational, economic, and social issues involved in solving complex real-world problems. (SP) *Staff*

230A. Linear Models. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Matrix algebra, a year of calculus, two semesters of upper division or graduate probability and statistics*. Theory of least squares estimation, interval estimation, and tests under the general linear fixed effects model with normally distributed errors. Large sample theory for non-normal linear models. Two and higher way layouts, residual analysis. Effects of departures from the underlying assumptions. Robust alternatives to least squares.

232. Experimental Design. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: 200B or equivalent*. Randomization, blocking, factorial design, confounding, fractional replication, response surface methodology, optimal design. Applications.

C239A. The Statistics of Causal Inference in the Social Science. (4) Three hours of lecture and two hours of discussion per week. *Prerequisites: At least one multivariate Regression Course*. Approaches to causal inference using the potential outcomes framework. Covers observational studies with and without ignorable treatment assignment, randomized experiments with and without noncompliance, instrumental variables, regression discontinuity, sensitivity analysis and randomization inference. Applications are drawn from a variety of fields including political science, economics, sociology, public health and medicine. Also

listed as Political Science C236A. (F,SP)

240. Nonparametric and Robust Methods. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: A year of upper division probability and statistics*. Standard nonparametric tests and confidence intervals for continuous and categorical data; nonparametric estimation of quantiles; robust estimation of location and scale parameters. Efficiency comparison with the classical procedures. (F)

C241A. Statistical Learning Theory. (3) Three hours of lecture per week. *Prerequisites: Linear algebra, calculus, basic probability, and statistics, algorithms. Computer Science 289 recommended*. Classification regression, clustering, dimensionality, reduction, and density estimation. Mixture models, hierarchical models, factorial models, hidden Markov, and state space models, Markov properties, and recursive algorithms for general probabilistic inference nonparametric methods including decision trees, kernal methods, neural networks, and wavelets. Ensemble methods. Also listed as Computer Science C281A. (F) *Bartlett, Jordan, Wainwright*

C241B. Advanced Topics in Learning and Decision Making. (3) Three hours of lecture per week. *Prerequisites: Computer Science C281A/Statistics C241A*. Recent topics include: Graphical models and approximate inference algorithms. Markov chain Monte Carlo, mean field and probability propagation methods. Model selection and stochastic realization. Bayesian information theoretic and structural risk minimization approaches. Markov decision processes and partially observable Markov decision processes. Reinforcement learning. Also listed as Computer Science C281B. (SP) *Bartlett, Jordan, Wainwright*

243. Introduction to Statistical Computing. (4) Course may be repeated for credit. Three hours of lecture and two hours of laboratory per week. *Prerequisites: Graduate standing*. The structure and use of statistical languages and packages. Use of graphical displays in data analysis. Statistical data base management. (F)

244. Statistical Computing. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Knowledge of a higher level programming language*. Algorithms in statistical computing: random number generation, generating other distributions, random sampling and permutations. Matrix computations in linear models. Non-linear optimization with applications to statistical procedures. Other topics of current interest, such as issues of efficiency, and use of graphics. (SP)

C245A. Biostatistical Methods: Advanced Categorical Data Analysis. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 200A (may be taken concurrently)*. This course focuses on statistical methods for discrete data collected in public health, clinical and biological studies. Lectures topics include proportions and counts, contingency tables, logistic regression models, Poisson regression and log-linear models, models for polytomous data and generalized linear models. Computing techniques, numerical methods, simulation and general implementation of biostatistical analysis techniques with emphasis on data applications. Also listed as Public Health C240A. Offered odd-numbered years. (F) *Staff*

C245B. Biostatistical Methods: Survival Analysis and Causality. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 200B (may be taken concurrently)*. Analysis of survival time data using parametric and non-parametric models, hypothesis testing, and methods for analyzing censored (partially observed) data with covariates. Topics include marginal estimation of a survival function, estimation of a generalized multivariate linear regression model (allowing missing covariates and/or outcomes), estimation of a multiplicative intensity model (such as Cox proportional hazards model) and estimation of causal parameters assuming marginal structural models. General theory for developing locally efficient estimators of the parameters of interest in censored data models. Computing techniques, numerical methods, simulation and general implementation of biostatistical analysis techniques with emphasis on data applications. Also listed as Public Health C240B. Offered even-numbered years. (SP) *van der Laan*

C245C. Biostatistical Methods: Computational Statistics with Applications in Biology and Medicine. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Statistics 200A-200B (may be taken concurrently) or consent of instructor*. This course provides an introduction to computational statistics, with emphasis on statistical methods and software for addressing high-dimensional inference problems in biology and medicine. Topics include numerical and graphical data summaries, loss-based estimation (regression, classification, density estimation), smoothing, EM algorithm, Markov chain Monte-Carlo, clustering, multiple testing, resampling, hidden Markov models, in silico experiments. Also listed as Public Health C240C. Offered even-numbered years. (F) *Dudoit*

C245E. Statistical Genomics. (4) Three hours of lecture and one hour of discussion per week. *Prerequisites: Statistics 200A and 200B or equivalent (may be taken concurrently). A course in algorithms and knowledge of at least one computing language (e.g., R, matlab) is recommended*. Genomics is one of the fundamental areas of research in the biological sciences and is rapidly becoming one of the most important application areas in statistics. This is the first course of a two-semester sequence, which provides an

introduction to statistical and computational methods for the analysis of meiosis, population genetics, and genetic mapping. The second course is Statistics C245F/Public Health C240F. The courses are primarily intended for graduate students and advanced undergraduate students from the mathematical sciences. Also listed as Public Health C240E. (SP) *Dudoit, Huang, Nielsen, Song*

C245F. Statistical Genomics. (4) Three hours of lecture and one hour of discussion per week. *Prerequisites: Statistics 200A-200B or equivalent (can be taken concurrently). A course in algorithms and knowledge of at least one computing language (e.g., R, matlab) is recommended*. Genomics is one of the fundamental areas of research in the biological sciences and is rapidly becoming one of the most important application areas in statistics. The first course in this two-semester sequence is Public Health C240E/Statistics C245E. This is the second course, which focuses on sequence analysis, phylogenetics, and high-throughput microarray and sequencing gene expression experiments. The courses are primarily intended for graduate students and advanced undergraduate students from the mathematical sciences. Also listed as Public Health C240F. (SP) *Dudoit, Huang, Nielsen, Song*

C247C. Longitudinal Data Analysis. (4) Three hours of lecture and two hours of discussion per week. *Prerequisites: Public Health 142, 145, and 241, or equivalent courses in basic statistics, linear and logistic regression*. The course covers the statistical issues surrounding estimation of effects using data on subjects followed through time. The course emphasizes a regression model approach and discusses disease incidence modeling and both continuous outcome data/linear models and longitudinal extensions to nonlinear models (e.g., logistic and Poisson). The primary focus is from the analysis side, but mathematical intuition behind the procedures will also be discussed. The statistical/mathematical material includes some survival analysis, linear models, logistic and Poisson regression, and matrix algebra for statistics. The course will conclude with an introduction to recently developed causal regression techniques (e.g., marginal structural models). Time permitting, serially correlated data on ecological units will also be discussed. Also listed as Public Health C242C. Offered even-numbered years. (SP) *Hubbard, Jewell*

248. Analysis of Time Series. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: 102 or equivalent*. Frequency-based techniques of time series analysis, spectral theory, linear filters, estimation of spectra, estimation of transfer functions, design, system identification, vector-valued stationary processes, model building.

C249A. Censored Longitudinal Data and Causality. (4) Three hours of lecture and two hours of laboratory per week. *Prerequisites: Public Health 240B, Statistics 200A-200B, or consent of instructor*. This course examines optimal robust methods for statistical inference regarding causal and non-causal parameters based on longitudinal data in the presence of informative censoring and informative confounding of treatment. Models presented include multivariate regression models, multiplicative intensity models for counting processes, and causal models such as marginal structural models and structural nested models. Methods will be illustrated with data sets of practical interest and analyzed in the laboratory section. This course, appropriate for advanced masters and Ph.D. students, provides exposure to a number of ongoing research topics. Also listed as Public Health C246A. Offered odd-numbered years. (SP) *van der Laan*

260. Topics in Probability and Statistics. (3) Course may be repeated for credit. Three hours of lecture per week. Special topics in probability and statistics offered according to student demand and faculty availability.

C261. Quantitative/Statistical Research Methods in Social Sciences. (3) Two hours of lecture per week. *Prerequisites: Consent of instructor*. Selected topics in quantitative/statistical methods of research in the social sciences and particularly in sociology. Possible topics include: analysis of qualitative/categorical data; loglinear models and latent-structure analysis; the analysis of cross-classified data having ordered and unordered categories; measure, models, and graphical displays in the analysis of cross-classified data; correspondence analysis, association analysis, and related methods of data analysis. Also listed as Sociology C271D.

272. Statistical Consulting. (3) Course may be repeated for credit. Two hours of session per week and individual meetings as necessary. Must be taken on a *satisfactory/unsatisfactory* basis. *Prerequisites: Some course work in applied statistics and permission of instructor*. To be taken concurrently with service as a consultant in the department's drop-in consulting service. Participants will work on problems arising in the service and will discuss general ways of handling such problems. There will be working sessions with researchers in substantive fields and occasional lectures on consulting. (F,SP)

278B. Statistics Research Seminar. (1-4) Course may be repeated for credit. Two or more hours of seminar per week. Must be taken on a *satisfactory/unsatisfactory* basis. Special topics, by means of lectures and informational conferences. (F,SP)

298. Directed Study for Graduate Students. (1-12) Course may be repeated for credit. *Prerequisites: Consent of instructor*. Special tutorial or seminar on selected topics. (F,SP)

299. Individual Study Leading to Higher Degrees. (2-12) Course may be repeated for credit. (F,SP)

601. Individual Study for Master's Candidates. (1-8) Course may be repeated for a maximum of 16 units. By appointment. Must be taken on a *satisfactory/unsatisfactory* basis. Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for the master's comprehensive examinations. Units may not be used to meet either unit or residence requirements for a master's degree. (F,SP)

602. Individual Study for Doctoral Candidates. (1-8) Course may be repeated for a maximum of 16 units. Course does not satisfy unit or residence requirements for doctoral degree. Must be taken on a *satisfactory/unsatisfactory* basis. *Prerequisites: One year of full-time graduate study and permission of the graduate adviser*. Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for certain examinations required of candidates for the Ph.D. degree. (F,SP) *Staff*

Professional Courses

375. Professional Preparation: Teaching of Probability and Statistics. (2-4) Course may be repeated for credit. One or two hours of lecture and two to four of laboratory per week. Must be taken on a *satisfactory/unsatisfactory* basis. *Prerequisites: Graduate standing and appointment as a graduate student instructor*. *Formerly Statistics 300*. Discussion, problem review and development, guidance of laboratory classes, course development, supervised practice teaching. (F,SP)

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