STATISTICS AND PROBABILITY

Department of Statistics and Probability
College of Natural Science

200 Statistical Methods
Fall, Spring, Summer. 3(4-0) P: (MTH 103 or MTH 110 or MTH 116 or MTH 124 or MTH 132 or LB 118) or designated score on Mathematics Placement test Not open to students with credit in STT 201 or STT 421.
Data analysis, probability models, random variables, estimation, tests of hypotheses, confidence intervals, and simple linear regression.

201 Statistical Methods
Fall, Spring, Summer. 4(3-2) P: (MTH 103 or MTH 110 or MTH 116 or MTH 124 or MTH 132 or LB 118) or designated score on Mathematics Placement test Not open to students with credit in STT 200 or STT 421.
Probability and statistics with computer applications. Data analysis, probability models, random variables, tests of hypotheses, confidence intervals, simple linear regression. Weekly lab using statistical software.

224 Introduction to Probability and Statistics for Ecologists
Spring. 3(2-2) Interdepartmental with Fisheries and Wildlife. Administered by Statistics and Probability. P: MTH 103 or MTH 116 or (MTH 124 or concurrently) or (MTH 132 or concurrently) or (MTH 152H or concurrently) or (LB 118 or concurrently) RB: BS 110 or BS 148H or LB 144 SA: FW 324 Not open to students with credit in STT 231.
Probability and statistics with computer applications for the analysis, interpretation and presentation of ecological data. Data analysis, probability models, random variables, estimation, confidence intervals, test of hypotheses, and simple linear regression with applications to ecology.

231 Statistics for Scientists
Fall, Spring, Summer. 3(3-0) P: MTH 124 or MTH 132 or MTH 152H or LB 118 R: Open to students in the College of Natural Science and open to students in the Lyman Briggs College. SA: STT 331
Calculus-based course in probability and statistics. Probability models, and random variables. Estimation, confidence intervals, tests of hypotheses, and simple linear regression with applications in sciences.

290 Topics in Statistics and Probability
Fall, Spring, Summer. 1 to 3 credits. RB: MTH 103 R: Approval of department.
Individualized study of selected topics.

315 Introduction to Probability and Statistics for Business
Fall, Spring, Summer. 3(4-0) P: MTH 124 or MTH 132 or MTH 152H or LB 118
A first course in probability and statistics primarily for business majors. Data analysis, probability models, random variables, confidence intervals, and tests of hypotheses with business applications.

317 Quantitative Business Research Methods
Fall, Spring, Summer. 3(3-1) Interdepartmental with Marketing. Administered by Marketing. P: STT 315 R: Open to juniors or seniors in the Eli Broad College of Business and The Eli Broad Graduate School of Management and not open to undergraduate students in the School of Hospitality Business. SA: MSC 317
Application of statistical techniques, including forecasting, to business decision making. Includes applications of linear regression and correlation, analysis of variance, selected non-parametric tests, time series, and index numbers.

351 Probability and Statistics for Engineering
Fall, Spring, Summer. 3(3-0) P: MTH 234 or MTH 254H or LB 220 Not open to students with credit in STT 430.
Probability models and random variables. Estimation, confidence intervals, tests of hypotheses, simple linear regression. Applications to engineering.

371 Statistical Biology
Spring. 3(3-0) Interdepartmental with Mathematics. Administered by Statistics and Probability. P: (MTH 132 or LB 118 or approval of department) and (STT 231 or STT 351 or STT 421 or STT 441 or STT 464 or approval of department) and (BS 110 or BS 111 or BS 148H or BS 149H or LB 144 or LB 145 or LB 140H or LB 149H)
Probability models in biological systems. Design and analysis of biological experiments including ANOVA models. Multiple testing, Classification and clustering for genomic and proteomic data. Computational software packages. Internet-based query systems.

411 Probability and Statistics I
Fall, Spring, Summer. 3(3-0) P: MTH 103 or MTH 110 or MTH 116 Not open to students with credit in STT 200 or STT 201.
Basic probability, random variables, and common distributions. Estimation and tests for one-, two-, and paired sample problems. Introduction to simple linear regression and correlation, one-way ANOVA.

412 Statistics II
Fall, Spring, Summer. 3(3-0) RB: STT 421 Not open to students with credit in STT 464.
Goodness of fit and other non-parametric methods. Linear models including multiple regression and ANOVA for simple experimental designs.

420 Introduction to Probability and Statistics
Fall, Spring, Summer. 3(3-0) P: MTH 132 or MTH 152H or LB 118 R: Open to students in the College of Natural Science and open to students in the Lyman Briggs College. SA: STT 331
Calculus-based course in probability and statistics. Probability models, and random variables. Estimation, confidence intervals, tests of hypotheses, and simple linear regression with applications in sciences.

422 Statistical Computation
Fall, Spring, Summer. 3(3-0) Interdepartmental with Animal Science and Crop and Soil Sciences. Administered by Statistics and Probability. RB: STT 421
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.

423 Statistics for Business
Fall, Spring, Summer. 3(3-0) P: MTH 124 or MTH 132 or MTH 152H or LB 118 R: Open to students in the College of Natural Science and open to students in the Lyman Briggs College. SA: STT 331
Calculus-based course in probability and statistics. Probability models, and random variables. Estimation, confidence intervals, tests of hypotheses, and simple linear regression with applications in sciences.

430 Topics in Statistics and Probability
Fall, Spring, Summer. 3(3-0) P: MTH 234 or concurrently Not open to students with credit in STT 351.
Calculus-based probability and statistics with applications. Discrete and continuous random variables and their expectations. Point and interval estimation, tests of hypotheses, and simple linear regression.

441 Probability and Statistics I: Probability
Fall, Spring, Summer. 3(3-0) RB: MTH 234 or MTH 254H or LB 220

442 Probability and Statistics II: Statistics
Spring. 3(3-0) RB: STT 441 and (MTH 309 or MTH 314 or MTH 415)
Estimation, testing hypotheses and simple and multiple regression analysis. Time series: ARMA (Auto Regressive Moving Average) and ARIMA (Auto Regressive Integrated Moving Average) models, data analysis and forecasting.

455 Actuarial Models
Spring. 3(3-0) Interdepartmental with Mathematics. Administered by Statistics and Probability. RB: STT 441 and MTH 360
Stochastic models used in insurance. Survival distributions, life insurance, life annuities, benefit premiums, benefit reserves, and analysis of benefit reserves.

461 Computations in Probability and Statistics
Spring. 3(3-0) RB: CSE 131 and STT 441 and (MTH 309 or MTH 314)
Computer algorithms for evaluation, simulation and visualization. Sampling and prescribed distributions. Robustness and error analysis of procedures used by statistical packages. Graphics for data display, computation of probabilities and percentiles.

464 Statistics for Biologists
Fall. 3(3-0) Interdepartmental with Animal Science and Crop and Soil Sciences. Administered by Statistics and Probability. RB: STT 421
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.

481 Issues in Statistical Practice
Spring. 1(1-0) P: Completion of Tier I writing requirement. R: Open only to seniors in the Department of Statistics.
Selected readings and projects illustrating special problems encountered by professional statisticians in their roles as consultants, educators, and analysts.

490 Directed Study of Statistical Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to juniors or seniors in the Department of Mathematics or Department of Statistics. Approval of department. Individualized study of selected topics.

801 Design of Experiments
Fall of even years. 3(3-0) RB: STT 422 or STT 442 or STT 471

802 Statistical Computation
Fall. 3(3-0) RB: (STT 442 and MTH 309) or (statistical mathematics and linear algebra)

STT—Statistics and Probability
Statistics and Probability—STT

808 Biostatistics I
Fall. 3(3-0) Interdepartmental with Epidemiology. Administered by Epidemiology. RB: College-level algebra. R: Open to masters students or doctoral students in the Epidemiology major or approval of department. SA: STT 426
Applications of probability and statistics in the applied health sciences. Probability distributions, estimation and tests for one-, two-, and paired samples, linear regression, correlation, and ANOVA. Use of statistical software. Critical appraisal of statistical methods in the biomedical literature.

809 Biostatistics II
Spring. 3(3-0) Interdepartmental with Epidemiology. Administered by Epidemiology. P: EPI 808 RB: MTH 103 or MTH 110 or MTH 116 R: Open to masters students or doctoral students in the Epidemiology major or approval of department. SA: STT 426
Analysis of categorical data in epide miologic studies. Contingency tables and logistic regression.

814 Advanced Statistics for Biologists
Spring. 4(3-2) Interdepartmental with Animal Science and Crop and Soil Sciences. Administered by Statistics and Probability. RB: STT 464

820A Econometrics IA
Fall. 3(3-0) Interdepartmental with Economics. Administered by Economics. R: Open only to doctoral students in the Economics major or the Department of Agricultural Economics or the Business Administration major or approval of department. SA: FOR 850.
Statistical tools for econometrics. Applications of statistical tools, including probability distributions, estimation, hypothesis testing, and maximum likelihood to econometric problems.

822A Time Series Econometrics I
Fall. 3(3-0) Interdepartmental with Agricultural Economics and Economics and Finance. Administered by Economics. P: EC 820B SA: EC 822
Analyses of time series regression, stationary time series analysis, ARMA models, Wold decomposition, spectral analysis, vector autoregressions, generalized method of moments, functional central limit theorem, nonstationary time series, unit root processes, cointegration, and other advanced topics.

822B Time Series Econometrics II
Spring. 3(3-0) Interdepartmental with Agricultural Economics and Economics and Finance. Administered by Economics. P: EC 822A
Analyses of multivariate time series, time series volatility models, long memory, nonlinear time series models, and other advanced topics.

825 Sample Surveys
Fall. 3(3-0) RB: STT 422 or STT 442 or STT 862
Applications of statistical sampling theory to survey designs. Simple random, stratified, and systematic samples. Sub-sampling, double sampling. Ratio and regression estimators.

843 Multivariate Analysis
Spring of even years. 3(3-0) RB: STT 442 or STT 862 Not open to students with credit in FW 850.

844 Time Series Analysis
Spring of odd years. 3(3-0) RB: STT 442 or STT 862

847 Analysis of Survival Data
Spring of odd years. 4(3-0) Interdepartmental with Epidemiology. Administered by Statistics and Probability. RB: STT 422 or STT 442 or STT 862

850 Applied Multivariate Statistical Methods
Spring of even years. 4(3-2) Interdepartmental with Fisheries and Wildlife. Administered by Fisheries and Wildlife. RB: (STT 422 or concurrently) and MTH 314 SA: FOR 476
Application of multivariate methods to research problems. Hotelling’s T-test, profile analysis, discriminant analysis, canonical correlation, principal components, principal coordinates, correspondence analysis, and cluster analysis.

855 Statistical Genetics
Fall of odd years. 3(3-0) RB: STT 442 or STT 862
Probabilistic and statistical methods for genetic linkage and association studies. Quantitative trait locus mapping.

861 Theory of Probability and Statistics I
Fall. 3(3-0) RB: MTH 320 or concurrently

862 Theory of Probability and Statistics II
Spring. 3(3-0) RB: STT 861 and (MTH 415 or concurrently)
Statistical inference: sufficiency, likelihood, estimation, and tests of hypotheses in parametric and nonparametric cases. Linear models, goodness of fit, and other topics.

863 Applied Statistics Methods I
Fall. 3(3-0) RB: (STT 442 or STT 862) and (MTH 415 or concurrently) SA: STT 841
Application of regression models including simple and multiple regression, model diagnostics, model selection, one- and two-way analysis of variance, mixed effects models, randomized block designs, and logistic regression.

864 Applied Statistical Methods II
Spring of odd years. 3(3-0) RB: STT 863
Generalized linear models, loglinear models, hierarchical models, repeated measures, discriminant analysis and classification, clustering, regression, classification trees, selected nonparametric methods.

865 Modern Statistical Methods
Spring of even years. 3(3-0) RB: STT 863

866 Spatial Data Analysis
Fall. 4(3-2) Interdepartmental with Geography. Administered by Geography. RB: (GEO 363 or STT 421 or STT 430) or equivalent quantitative methods courses. SA: GEO 468
Theory and techniques for statistical analysis of point patterns, spatially continuous data, and data in spatial zones.

871 Theory of Statistics I
Fall. 3(3-0) RB: (MTH 828 or concurrently) and (STT 881 or concurrently)

872 Theory of Statistics II
Spring. 3(3-0) RB: STT 871 and (STT 882 or concurrently)
Theory of Neyman Pearson tests and extensions. Convex loss estimation, best unbiased estimates, sufficient statistics, information lower bounds. Extensive application to linear models. LAN families and applications to estimation and tests.

881 Theory of Probability II
Fall. 3(3-0) RB: MTH 828 or concurrently
882  **Theory of Probability II**  
Spring. 3(3-0) RB: STT 881  

886  **Stochastic Processes and Applications**  
Fall. 3(3-0) RB: STT 441 or STT 861  
Markov chains and their applications in both discrete and continuous time, including classification of states, recurrence, limiting probabilities. Queueing theory, Poisson process and renewal theory.

888  **Stochastic Models in Finance**  
Spring of even years. 3(3-0) RB: STT 441 or STT 882 SA: STT 887  

890  **Statistical Problems**  
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Approval of department.  
Individualized study on selected problems.

899  **Master's Thesis Research**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Approval of department.  
Master's thesis research.

914  **Applied Regression Models in Business Research**  
Spring. 3(3-0) Interdepartmental with Management. Administered by Management. RB: (STT 430 or STT 441) or or equivalent R: Open only to Ph.D. students in the College of Business or approval of department.  
Seminar on design and analysis of regression-based statistical models. Modeling issues arising in business research.

920  **Advanced Methods in Epidemiology and Applied Statistics**  
Spring of even years. 3(3-0) Interdepartmental with Epidemiology. Administered by Epidemiology. P: EPI 826  
Pattern recognition and cluster analysis, longitudinal data analysis, path analysis, repeated measures and time-series analysis.

933  **Asymptotic Theory**  
Fall of even years. 3(3-0) RB: STT 872  
Asymptotics of M- and R- estimators. Asymptotically efficient and adaptive procedures.

954  **Semi-Nonparametric Inference**  
Fall of odd years. 3(3-0) RB: STT 872  
Robust procedures in regression and time series settings, nonparametric curve estimation, survival analysis in non- and semi-parametric models.

961  **Convergence of Measures and Stochastic Processes**  
Spring of odd years. 3(3-0) RB: STT 882  

964  **Stochastic Analysis**  
Spring of even years. 3(3-0) RB: STT 882  