Statistics - STAT

Courses

STAT 1010 DATA EPISTEMOLOGY (3) LEC. 3. This course will provide the basic tools to understand, interpret and reason with data in order to critically think about data-driven knowledge. Acquiring notions of logical reasoning and data literacy, the students will know how to analyze and ask the correct questions regarding data collection, representation and interpretation.

STAT 2010 STATISTICS FOR SOCIAL AND BEHAVIOR SCIENCES (4) LEC. 3. LAB. 2. Pr. MATH 1100 or MATH 1120 or MATH 1123 or MATH 1130 or MATH 1133 or MATH 1150 or MATH 1153 or MATH 1610 or MATH 1613 or MATH 1617. Introduction to basic principles of statistical reasoning and statistical procedures used in data analysis in the social and behavioral sciences.

STAT 2017 HONORS STATISTICS FOR SOCIAL AND BEHAVIORAL SCIENCES (4) LEC. 3. LAB. 2. Pr. Honors College. Introduction to statistical data analysis, statistical packages, and APA-style statistical reporting use in research in Psychology and other social and behavioral sciences.

STAT 2510 STATISTICS FOR BIOLOGICAL AND HEALTH SCIENCES (3) LEC. 3. Pr. MATH 1100 or MATH 1120 or MATH 1123 or MATH 1130 or MATH 1133 or MATH 1150 or MATH 1153 or MATH 1610 or MATH 1613 or MATH 1617 or MATH 1680 or MATH 1683. Introduction to statistical concepts, reasoning and methods used in data analysis, descriptive statistics, sampling distributions, statistical inference, confidence intervals, regression or correlation, contingency tables. Students who have previous credit in any higher-numbered math course may not receive credit.

STAT 2600 BUSINESS ANALYTICS I (3) LEC. 3. Pr. MATH 1680 or MATH 1683 or P/C COMP 1000 or COMP 1003. Introduction to analytics in business including use of data to make business decisions, basic predictive business modeling, and communication of analytical results. Minimum 2.0 overall cumulative undergraduate GPA.

STAT 2610 STATISTICS FOR BUSINESS AND ECONOMICS (3) LEC. 3. Pr. MATH 1690. Introduction to statistical analysis, theory, and interpretation used in business and economics.

STAT 2710 STATISTICAL COMPUTING (1) LEC. 1. Pr. (P/C STAT 2010 or P/C STAT 2017) and (P/C STAT 2510 or STAT 2513) and P/C STAT 2610 and P/C STAT 3010. Introduction to basic statistical computing programs and methods..

STAT 3010 STATISTICS FOR ENGINEERS AND SCIENTISTS (3) LEC. 3. Pr. MATH 1610 or MATH 1613 or MATH 1617 or MATH 1710. Introduction to statistical methods and analysis used in engineering and science.

STAT 3600 PROBABILITY AND STATISTICS I (3) LEC. 3. Pr. MATH 1620 or MATH 1623 or MATH 1627 or MATH 1720. Calculus-based introduction to probability and statistics with an emphasis on practical problem-solving.

STAT 3610 PROBABILITY AND STATISTICS II (3) LEC. 3. Pr. STAT 3600. Departmental approval. Continuation of STAT 3600.

STAT 3611 PROBABILITY AND STATISTICS II LABORATORY (1) LAB. 2. Departmental approval. Coreq. STAT 3610. The application of statistical techniques from STAT 3610.

STAT 4000 INTRODUCTION TO DATA SCIENCE (3) LEC. 3. Pr. STAT 2010 or STAT 2017 or STAT 2510 or STAT 2513 or STAT 2600 or STAT 3010 or STAT 3600 or STAT 3603. Departmental approval. This course will provide an entry level introduction to the field of data science. The course will cover the essential statistical and computational tools including programming and analytical models, as well as teamwork, communication, and critical thinking.

STAT 4610 APPLIED REGRESSION ANALYSIS (3) LEC. 3. Pr. STAT 3610 or STAT 3010. Least squares estimation, hypothesis testing and confidence interval estimation in regression; simple, polynomial and multiple linear regression; residual and lack-of-fit analysis; use of dummy variables; multiple and partial correlation analysis; model building algorithms and model comparisons; transformations.

STAT 4620 APPLIED NONPARAMETRIC STATISTICS (3) LEC. 3. Review of elementary probability; goodness-of-fit tests; for singles and several location parameters; tests for scale parameters; distribution tests; measures of association; bootstrap and permutation tests.

STAT 4630 APPLIED TIME-SERIES ANALYSIS (3) LEC. 3. ARIMA models: the autoregressive process, the moving average process, and the ARMA process; forecasting, errors and confidence intervals, updating forecast models; estimation; model building and assessment; applications in econometrics.

STAT 4650 INTRODUCTION TO BAYESIAN STATISTICS (3) LEC. 3. LAB. 0. Pr. STAT 3610. This course will develop an introduction to the Bayesian thinking and the Fundamental Concepts in Bayesian Statistics.

STAT 4970 SPECIAL TOPICS IN STATISTICS (1-3) LEC. Departmental approval. Special topics designed to meet the needs and interest of students. Course may be repeated for a maximum of 6 credit hours.

STAT 4980 UNDERGRADUATE RESEARCH IN STATISTICS AND DATA SCIENCE (1-3) IND/RES. Directed research in Statistics and Data Science. Departmental Approval. Course may be repeated for a maximum of 3 credit hours.

STAT 5000 INTERMEDIATE STATISTICAL METHODS FOR DATA SCIENCE (3) LEC. 3. Pr. STAT 3610 or STAT 3010. C Grade or better in STAT3610 or STAT3010 or equivalent. Principles of probability and statistics, multiple testing and bootstrapping, parametric and nonparametric regression, generalized linear models, time dependent data with a focus on Data Science.

STAT 5110 SAS PROGRAMMING AND APPLICATIONS (3) LEC. 3. Pr. STAT 3010 or STAT 3610. Emphasis is placed on using SAS routines to obtain statistical analyses for common statistical methods and interpreting output.

STAT 5210 R PROGRAMMING FOR DATA SCIENCE (3) LEC. 3, LEC. 3. Pr. STAT 2510 or STAT 3010 or STAT 3610. Fundamental concepts on R programming language and popular R packages. Topics include basic syntax, R objects, control flow, file input and output, building R packages, data manipulation, visualization, interface to C, parallel computing, building web apps.

STAT 5330 DATA BASED DECISION MAKING USING SIX SIGMA (3) LEC. 3. Pr. STAT 3610 and INSY 4330. Departmental approval. Covers statistical tools needed for implementation of "Six Sigma", "Learn Six Sigma" and "Design for Six Sigma". Credit will not be given for both STAT 5330 and STAT 6330/ 6336.

STAT 5600 PROBABILITY AND STATISTICS FOR DATA SCIENCE (3) LEC. 3. Pr. STAT 3610 or STAT 3010 or MATH 1620. Grade of C or better in STAT 3610 or STAT 3010 and Grade of C or better in MATH 1620 or equivalent. Basic probability theory, random variables, multivariate random variables, expectation, random processes, times series, convergence of random processes, Markov chains, maximum likelihood estimation, Bayesian statistics, hypothesis testing, prediction, sampling and resampling methods, multivariate statistics.

STAT 5610 FUNDAMENTALS OF STATISTICAL INFERENCE I (3) LEC. 3. Pr. STAT 3600 and STAT 3610. Probability and independence; discrete and continuous distributions, random variable, moments; joint, marginal, conditional distributions; exponential families; bivariate transformations, covariance and correlation; multivariate distributions, sums of random variables, sampling distributions for normal data, order statistics; convergence of random variables, principles of data reduction; the likelihood principle.

STAT 5620 FUNDAMENTALS OF STATISTICAL INFERENCE II (3) LEC. 3. Pr. STAT 5610. Properties of random samples; generating a random sample; point and interval estimation; hypothesis testing; Analysis of Variance: one-way ANOVA, multi-way ANOVA and ANCOVA; linear regression, multiple regression and GLM methods, logistic regression.

STAT 5630 SAMPLE SURVEY, DESIGN AND ANALYSIS (3) LEC. 3. Pr. STAT 3600. Departmental approval. Estimation of means, proportions, finite populations, stratified sampling, systematic sampling ratio estimations.

STAT 5650 STATISTICAL LEARNING (3) LEC. 3. Pr. STAT 5000. or equivalent. Introduction to modern methods and algorithms in Statistics. Topics include common supervised and unsupervised learning methods such as linear regression, logistic regression, regularization, non-parametric regression, model assessment and selection, neural network, support vector machines, principal components analysis.

STAT 5670 PROBABILITY AND STOCHASTIC PROCESSES I (3) LEC. 3. Pr. MATH 2630 or MATH 2637. Random variables, discrete and absolutely continuous distributions. Poisson process, expectation and conditional expectation. Moment generating functions, limit distributions. Emphasis on probabilistic reasoning and problem solving. Credit will not be given for both STAT 5670 and MATH 5670.

STAT 5680 PROBABILITY AND STOCHASTIC PROCESSES II (3) LEC. 3. Pr. STAT 5670 or MATH 5670. Multivariate distributions, Central Limit Theorem, Laplace transforms, convolutions, simulations, renewal processes Continuous-time Markov chains, Markov renewal and semi-regenerative processes, Brownian motion and diffusion. Credit will not be given for both STAT 5680 and MATH 5680.

STAT 5690 CHAOTIC AND RANDOM PHENOMENA (3) LEC. 3. Pr. MATH 1620 or MATH 1623 or MATH 1627. Statistics and modeling of random phenomena in connection to computational complexity, data analysis, processes of chance and chaotic nonlinear systems. Credit will not be given for both STAT 5690 and MATH 5690.

STAT 6000 INTERMEDIATE STATISTICAL METHODS FOR DATA SCIENCE (3) LEC. 3. Pr. STAT 3610 or STAT 3010. C Grade or better in STAT 3610 or STAT 3010 or equivalent. Principles of probability and statistics, multiple testing and bootstrapping, parametric and nonparametric regression, generalized linear models, time-dependent data.

STAT 6110 SAS PROGRAMMING AND APPLICATIONS (3) LEC. 3. Pr. STAT 3010 or STAT 3610 or P/C STAT 7000. Emphasis is placed on using SAS routines to obtain statistical analyses for common statistical methods and interpreting output.

STAT 6210 R PROGRAMMING FOR DATA SCIENCE (3) LEC. 3. Pr. STAT 2510 or STAT 3010 or STAT 3610. Fundamental concepts on R programming language and popular R packages. Topics include basic syntax, R objects, control flow, file input and output, building R packages, data manipulation, visualization, interface to C, parallel computing, building web apps.

STAT 6330 DATA BASED DECISION MAKING USING SIX SIGMA (3) LEC. 3. Pr. STAT 3610 and INSY 4330. Departmental approval. Covers statistical tools needed for implementation of "Six Sigma", "Learn Six Sigma" and "Design for Six Sigma". Credit will not be given for both STAT 5330 and STAT 6330/ 6336.

STAT 6600 PROBABILITY AND STATISTICS FOR DATA SCIENCE (3) LEC. 3. Pr. STAT 3610 or STAT 3010 and (MATH 1620 or MATH 1623 or MATH 1627). Grade of C or better in STAT 3610 or STAT 3010 and Grade of C or better in MATH 1620 or equivalent. Basic probability theory, random variables, multivariate random variables, expectation, random processes, times series, convergence of random processes, Markov chains, Maximum Likelihood Estimation, Bayesian statistics, hypothesis testing, prediction, Sampling and Resampling methods, multivariate statistics.

STAT 6610 FUNDAMENTALS OF STATISTICAL INFERENCE I (3) LEC. 3. Pr. STAT 3600 and STAT 3610. This class is first of a two-semester sequence in probability and statistics taught at a calculus-based level. Students should gain an understanding of probability and random variables in order to have the foundation to conduct statistical inference in STAT 5620/6620.

STAT 6620 FUNDAMENTALS OF STATISTICAL INFERENCE II (3) LEC. 3. Pr. STAT 6610. This class is second of a two-semester sequence in probability and statistics taught at a calculus-based level. Students should gain an understanding of inference for the practice of statistics.

STAT 6630 SAMPLE SURVEY, DESIGN AND ANALYSIS (3) LEC. 3. Pr. STAT 3600. Departmental approval. Estimation of means, proportions, finite populations, stratified sampling systematic sampling ratio estimations.

STAT 6650 STATISTICAL LEARNING (3) LEC. 3. Pr. STAT 6000. or equivalent. Introduction to modern methods and algorithms in Statistics. Topics include common supervised and unsupervised learning methods such as linear regression, logistic regression, regularization, non-parametric regression, model assessment and selection, neural network, support vector machines, principal components analysis.

STAT 6670 PROBABILITY AND STOCHASTIC PROCESSES I (3) LEC. 3. Pr. MATH 2630 or MATH 2637. Random variables, discrete and absolutely continuous distributions. Poisson process, expectation and conditional expectation. Moment generating functions, limit distributions. Emphasis on probabilistic reasoning and problem solving. Credit will not be given for both STAT and MATH 6670.

STAT 6680 PROBABILITY AND STOCHASTIC PROCESSES II (3) LEC. 3. Pr. MATH 6670 or MATH 6676 or STAT 6670 or STAT 6676. Multivariate distributions, Central Limit Theorem, Laplace transforms, convolutions, simulations, renewal processes Continuous-time Markov chains, Markov renewal and semi-regenerative processes, Brownian motion and diffusion. Credit will not be given for both STAT 6680 and MATH 6680.

STAT 6690 CHAOTIC AND RANDOM PHENOMENA (3) LEC. 3. Pr. MATH 1620 or MATH 1623 or MATH 1627. Statistics and modeling of random phenomena in connection to computational complexity, data analysis, processes of chance and chaotic nonlinear systems. Credit will not be given for both STAT 6690 and MATH 6690.

STAT 6830 STATISTICS AND PROBABILITY FOR TEACHERS (3) LEC. 3. Pr. STAT 3010 or STAT 3600 or STAT 3603. Connections of advanced college-level mathematics with the secondary mathematics curriculum, focusing on statistics and probability, to develop mathematical knowledge relevant to teaching. Includes appropriate uses of technology and non-routine mathematics problem solving. Admission to a program in Secondary Mathematics Education or department approval required.

STAT 7000 EXPERIMENTAL STATISTICS I (4) LEC. 4. Departmental approval. Paired and independent sample t-tests, ANOVA, F-tests, contrasts, tests for trends, multiple comparisons, CR and RCB designs of experiments, regression.

STAT 7010 EXPERIMENTAL STATISTICS II (3) LEC. 3. Pr. STAT 7000. Advanced topics in experimental design: writing linear models for experiment-expected mean squares, variance components, nested designs, Latin Square Designs, split plot designs, ANOVA and multiple regression.

STAT 7020 REGRESSION ANALYSIS (3) LEC. 3. Pr. STAT 7000. Departmental approval. Introduction to the method of least squares as it applies to regression and analysis of variance. Simple linear regression, multiple regression, model selection and diagnostics.

STAT 7030 CATEGORICAL DATA ANALYSIS (3) LEC. 3. Pr. STAT 3600 or MATH 3600 or STAT 7000. Departmental approval. Methods for analysis or categorical response data. Topics include Chi-square tests, Likelihood Ratio tests, Logistic Regression, and Loglinear Modeling.

STAT 7040 BIOSTATISTICS (3) LEC. 3. Pr. STAT 7000. Departmental approval. Epidemiology, biometry, methods of survival analysis.

STAT 7100 STATISTICAL ANALYSIS OF SURVEY, AGGREGATE AND LARGE DATA SOURCES (3) LEC. 3. Pr. STAT 2010 or STAT 2017. Departmental approval. Techniques commonly used in multivariate statistical analysis of data sources such as surveys, archival records, and other large data sets. Credit will not be given for STAT 7100 and SOCY 7100.

STAT 7250 PRACTICAL DATA ANALYSIS AND COMPUTATION FOR THE LIFE SCIENCES (3) LEC. 2. LAB. 1. Pr. STAT 7020 or WILD 7150. Data from the life sciences and advanced statistical techniques for data analyses and computaMon are brought together through a cross-fertilization of graduate students in the life sciences, statistics, and mathematics. Focus on production of publication-quality research on student-identified projects.

STAT 7270 EXPERIMENTAL DESIGN IN PSYCHOLOGY (4) LEC. 4. Pr. STAT 7000 and STAT 7020. Introduction to the analysis of data collected under differential experimental designs. Credit will not be given for both STAT 7270 and PSYC 7270.

STAT 7300 ADVANCED ENGINEERING STATISTICS I (3) LEC. 3. Pr. STAT 3610. Departmental approval. Advanced concepts of experimental design including blocking, regression approach to analysis of variance, fractional factorials in base-2, and base-3 designs. Emphasis throughout is on improving industrial products and processes. Credit will not be given for both STAT 7300 and INSY 7300.

STAT 7310 ADVANCED ENGINEERING STATISTICS II (3) LEC. 3. Pr. STAT 7300 or STAT 7306 or INSY 7300 or INSY 7306. Fractional factorial experimentation applied for the purpose of process and quality improvement and optimization, introduction to analysis of covariance, multiple regression analysis, and response surface analysis. Credit will not be given for both STAT 7310 and INSY 7310.

STAT 7600 STATISTICAL THEORY AND METHODS I (3) LEC. 3. Pr. STAT 3600. Departmental approval. Random variables, probability theory, random variables, probability distributions, sampling distributions, convergence.

STAT 7610 STATISTICAL THEORY AND METHODS II (3) LEC. 3. Pr. STAT 7600. Likelihood ratio, regression, ANOVA, categorical data, non-parametric methods, decision theory.

STAT 7620 NONPARAMETRIC STATISTICS (3) LEC. 3. Pr. STAT 3600. Departmental approval. Distribution-free methods of statistical inference. Sign, Wilcoxon signed-rank, and Mann-Whitney tests for location, the Chi-Square and Kolmogorov-Smirnov tests for goodness-of-fit. Measures of association.

STAT 7630 BAYESIAN STATISTICS (3) LEC. 3. LAB. 0. Pr. STAT 3600 or STAT 3610. This course will develop an understanding of Bayesian principles and methodologies and cover the modeling and computation required to perform advanced data analysis from the Bayesian perspective.

STAT 7650 COMPUTATIONAL STATISTICS (3) LEC. 3. Pr. STAT 7020 and STAT 7610. This course covers the theory and practice of common algorithms used for simulation, computing, and optimization in Statistics.

STAT 7670 APPLIED LONGITUDINAL DATA ANALYSIS (3) LEC. 3. To introduce students to statistical models and methods for the analysis of longitudinal date, i.e. data collected repeatedly on individuals (humans, animals, etc) over time (or other conditions).

STAT 7700 GENERALIZED LINEAR MODELS (3) LEC. 3. Pr. STAT 7600. Departmental approval. Exponential families and links functions, model fitting, likelihood methods, residual diagnostics, count data, estimating equations.

STAT 7780 SURVIVAL ANALYSIS (3) LEC. 3. Pr. STAT 7000. Departmental approval. Kaplan-Meier estimator, log-rank tests, Cox proportional hazard model, fully parametric models.

STAT 7800 LINEAR MODELS (3) LEC. 3. Pr. STAT 7610 and MATH 2660. Departmental approval. A rigorous development of some of the important topics of applied statistics: the multivariate normal distribution analysis of variance, regression, aspects of experimental design.

STAT 7810 MODERN STOCHASTIC PROCESSES I (3) LEC. 3. Pr. (MATH 6670 or MATH 6676 or STAT 6670 or STAT 6676) and MATH 6210. Classical and Modern Topics in stochastic processes (Markov chains, Poisson process, Brownian motion). Applications and stochastic models (queues, stationary processes, population dynamics, finances). Credit will not be given for both STAT 7810 and MATH 7810.

STAT 7820 APPLIED STOCHASTIC PROCESSES I (3) LEC. 3. Pr. MATH 7810 or MATH 7816 or STAT 7810 or STAT 7816. Classical and modern topics in stochastic processes (Markov processes, Random Walks, Martingales, Brownian motion.) Introduction to stochastic integrals and differential equations. Applications (queues, population dynamics, chaos finances). Credit will not be given for both STAT 7820 and MATH 7820.

STAT 7830 APPLIED STOCHASTIC PROCESSES II (3) LEC. 3. Pr. STAT 7810 or STAT 7816.

STAT 7840 APPLIED MULTIVARIATE STATISTICAL ANALYSIS (3) LEC. 3. Pr. STAT 7000. Multivariate normal distribution, Hotelling's T2, MANOVA, discriminate analysis, principal components.

STAT 7850 THEORY OF STATISTICAL INFERENCE (3) LEC. 3. Pr. STAT 7610. Central limit theorem, Convergence, M-estimate, Statistical functional, U-statistics

STAT 7860 APPLIED TIME SERIES ANALYSIS (3) LEC. 3. Pr. STAT 3610. Departmental approval. Autoregressive and moving average models, differencing, estimation and forecasting, spectral theory.

STAT 7930 STATISTICAL CONSULTING PRACTICUM (3) PRA. 3. Pr. STAT 7000 and STAT 7010 and STAT 7020. This is a course in applied statistics, providing training in statistical consulting. Applications of commonly encountered statistical methods are explored in the consulting environment. Written and oral communication skills are emphasized, and ethical aspects of consulting are introduced. This course provides students with an opportunity to gain practical experience in consulting through various projects with clients, through the AU Statistical Consulting Center.

STAT 7940 CAPSTONE PROJECT (3) LEC. 3. Discuss various topics while working on an industry-level project. Students will complete a semester-long project under the supervision of instructors.

STAT 7950 SEMINAR (1) SEM. SU. Exploration of statistical concepts, fostering active learning through presentations, guest lectures, discussions, and student-led research presentations. Course may be repeated for a maximum of 2 credit hours.

STAT 7960 SPECIAL PROBLEMS IN STATISTICS (1-10) RES. Credit will not be given for both MATH 7960 and STAT 7960. Course may be repeated for a maximum of 10 credit hours.

STAT 7970 SPECIAL TOPICS (1-3) LEC. Departmental approval. Special topics designed to meet the needs and interests of students. Course may be repeated for a maximum of 6 credit hours.

STAT 7980 SPECIAL PROJECT (3) LEC. 3. SU. Departmental approval. Non-thesis project in Statistics for Master's degree in Statistics (non-thesis option).

STAT 7990 RESEARCH AND THESIS (1-10) DSR. Research for Master's thesis in Statistics. Course may be repeated with change in topic.

STAT 8400 ADVANCED QUANTITATIVE METHODS FOR MANAGEMENT I (3) LEC. 3. Pr. STAT 7000. or approved equivalent. Study of the application of linear regression analysis to business research. First advanced course in applied linear statistics models.

STAT 8410 ADVANCED QUANTITATIVE METHODS MANAGEMENT II (3) LEC. 3. or approved equivalent. Introduction to multivariate techniques in business research. Study of the theory and applications of ANOVA, ANCOVA, MANOVA, MANCOVE, Discriminate Analysis & Polytomous Logistic Regression.

STAT 8420 ADVANCED QUANTITATIVE METHODS FOR MANAGEMENT III (3) LEC. 3. Pr. STAT 7100 and STAT 8400 and STAT 8410. or approved equivalent. Third course in statistical modeling. Emphasis on applications of Principal Components Analysis, and Structural Equation Modeling to management research.

STAT 8990 RESEARCH AND DISSERTATION (1-10) LEC. 1-10. Individual doctoral dissertation research. May be repeated for credit. Course may be repeated with change in topics. Course may be repeated for a maximum of 30 credit hours.