

Hamilton Hoxie Ackerman: Math Course Information

MA214: Applied Statistics

Department: Statistics

Instructor: Ashis Gangopadhyay

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: ?

Subject Matter Covered: Inference about proportions, goodness of fit, student's t-distribution, tests for normality; two-sample comparisons, regression and correlation, tests for linearity and outliers, residual analysis, contingency tables, analysis of variance.

Language Used: SAS

MA225: Multivariate Calculus

Department: Mathematics

Instructor: Paul Blanchard

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Calculus: Concepts and Contexts*, 3rd Edition. By James Stewart, © 2005

Subject Matter Covered: Vectors, lines, planes. Multiple integration, cylindrical and spherical coordinates. Partial derivatives, directional derivatives, scalar and vector fields, the gradient, potentials, approximation, multivariate minimization, Stokes's and related theorems.

MA416: Intermediate Statistical Methods

Department: Statistics

Instructor: V. M. Moorthy

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Applied Linear Statistical Models*, 5th Edition. By Kutner, Nachtsheim, Neter, Li. © 2005

Subject Matter Covered: Fundamental concepts and analytical skills in analysis of variance, including crossed and nested designs, as well as fixed- and random-effect models. Trend analysis for repeated measures, expected mean squares, and nonparametric techniques.

Language Used: SAS

MA442: Linear Algebra Honors

Department: Mathematics

Instructor: Timothy Kohl

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Linear Algebra*, 4th Edition. By Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence. © 2003

Subject Matter Covered: Systems of linear equations; matrices, linear transformations, duality; determinants, characteristic and minimal polynomials; diagonalization and normal forms of linear transformations; inner products, unitary and self-adjoint operators, and spectral theory. Applications to physics, probability, and statistics.

MA226: Differential Equations

Department: Mathematics

Instructor: Robert Devaney

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Differential Equations: A Contemporary Approach*, 3rd Edition. By Paul Blanchard, Robert Devaney, Glen Hall, Jong-Eao Lee. © 2006

Subject Matter Covered: First-order linear and separable equations. Second-order equations and first-order systems. Linear equations and linearization. Numerical and qualitative analysis. Laplace transforms. Applications and modeling of real phenomena throughout.

MA293: Discrete Mathematics

Department: Mathematics

Instructor: Akihiro Kanamori

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Discrete Mathematics*, 2nd Edition. By Norman L. Biggs. © 2002

Subject Matter Covered: Propositional logic, set theory. Elementary probability theory. Number theory. Combinatorics with applications.

MA581: Probability

Department: Statistics

Instructor: Daniel Weiner

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *A Course in Probability*. By Neil A. Weiss. © 2006

Subject Matter Covered: Basic probability, conditional probability, independence. Discrete and continuous random variables, mean and variance, functions of random variables, moment generating function. Jointly distributed random variables, conditional distributions, independent random variables. Methods of transformations, law of large numbers, central limit theorem.

MA685: Advanced Topics in Applied Statistical Analysis

Department: Statistics

Instructor: Ralph D'Agostino, Sr.

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Applied Multivariate Statistics for the Social Sciences*. By James P. Stevens. © 2002

Subject Matter Covered: Canonical correlation, multivariate analysis of variance, multivariate regressions. Categorical dependent variables techniques; discriminant analysis, logistic regression, log-linear analysis. Factor analysis; principal-axes, rotations, factor scores. Cluster analysis. Power analysis.

Language used: SAS.

MA582: Mathematical Statistics

Department: Statistics

Instructor: Mamikon Ginovyan

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Introduction to Mathematical Statistics, 6th edition.* By Hogg, McKean, Craig. © 2005

Subject Matter Covered: Point estimation including unbiasedness, efficiency, consistency, sufficiency, minimum variance unbiased estimator, Rao-Blackwell theorem, and Rao-Cramer inequality. Maximum likelihood and method of moment estimations, interval estimation, tests of hypothesis.

MA583: Introduction to Stochastic Processes

Department: Mathematics and Statistics

Instructor: Uri Eden

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Stochastic Processes, 2nd edition.* By Sheldon M. Ross. © 1996

Subject Matter Covered: Poisson Processes (homogeneous, inhomogeneous), General Point Processes, Renewal Processes (with Rewards), Markov chains (discrete, continuous), time reversibility, birth and death processes, queuing theory, martingales, Wiener Processes.

MA584: Multivariate Statistical Analysis

Department: Statistics

Instructor: Dr. Surajit Ray

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Applied Multivariate Statistical Analysis, 6th edition.* By Richard Johnson and Dean Wichern. © 2007

Subject Matter Covered: Matrix algebra, MVN distribution, assessing normality, inferences, intervals, and ellipses for mean vectors, MANOVA (one-way, two-way), Principal Components Analysis, Factor Analysis, Canonical Correlation, Discriminant Analysis (LDA, QDA, neural nets, classification trees and random forests, support vector machine), Clustering (hierarchical, k-means), Mixture Models, Modal Clustering, Multidimensional Scaling.

Language used: R.

MA585: Time Series Analysis and Forecasting

Department: Mathematics

Instructor: Ashis Gangopadhyay

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Introduction to Time Series and Forecasting, 2nd edition.* By Peter Brockwell and Richard Davis. © 2002

Subject Matter Covered: Autocorrelation and partial autocorrelation functions, stationary and nonstationary processes, ARIMA and Seasonal ARIMA model identification, estimation, diagnostics, and forecasting. Transfer function models, intervention analysis.

MA511: Introduction to Analysis I

Department: Mathematics

Instructor: David Rohrlich

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Principles of Mathematical Analysis, 3rd edition*. By Walter Rudin. © 1976

Subject Matter Covered: Fundamental concepts of mathematical reasoning. Properties of the real-number system, elementary point-set theory, metric spaces. Limits, sequences, series, convergence, uniform convergence, continuity.

MA575: Linear Models

Department: Statistics

Instructor: Eric Kolaczyk

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Applied Linear Regression, 3rd Edition*. By Sanford Weisberg. © 2005

Subject Matter Covered: Simple and multiple linear regression, weighted and generalized least squares, polynomials and factors, transformations, regression diagnostics, variable selection, modern variable selection techniques.

Language Used: R

MA588: Nonparametric Statistics

Department: Statistics

Instructor: Mamikon Ginovyan

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Introduction to Modern Nonparametric Statistics*. By James J. Higgins. © 2004

Subject Matter Covered: One Sample Nonparametric Methods (confidence intervals for median, binomial test, sign test, order statistics, empirical CDF, location and scale functionals, confidence intervals for population CDF and percentiles), Two Sample Nonparametric Methods (permutation tests, Wilcoxon Rank-Sum Test, Mann-Whitney Test, Hodges-Lehmann Estimates and nonparametric confidence intervals for shift parameter, Kolmogorov-Smirnov Test), K-Sample Nonparametric Methods (permutation F-test, Kruskal-Wallis Test).

Language Used: SAS

BS821: Categorical Data Analysis

Department: Biostatistics

Instructor: David Gagnon

Grade: A

School: Boston University, School of Public Health

Text Used: None.

Subject Matter Covered: Ordinality/nominality, the binomial distribution and Fisher's exact test, odds/risk ratios, measures of effect in 2x2 tables, Breslow-Day test, stratified categorical data, confounding and effect modification, Mantel-Haenszel test, logistic regression, the Poisson distribution, Poisson regression and overdispersion, negative binomial regression, paired categorical data, ordinal data analysis, generalized additive models, smoothing.

Language Used: SAS

MA512: Introduction to Analysis II

Department: Mathematics

Instructor: David Rohrlich

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Principles of Mathematical Analysis, 3rd edition*. By Walter Rudin. © 1976

Subject Matter Covered: Compactness, connectedness, continuity, differentiability, Mean Value Theorem, Intermediate Value Theorem, Taylor's Theorem, Riemann sums/integrals, Fundamental Theorem of Calculus, pointwise/uniform convergence, Weierstrass M-Test, power series, function spaces, Banach spaces, Stone-Weierstrass Theorem (real and complex), Fourier Series, multivariate differentiation, Inverse Function Theorem.

MA576: Generalized Linear Models

Department: Statistics

Instructor: Surajit Ray

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Generalized Linear Models, 2nd Edition*. By McCullagh and Nelder. © 1989

Subject Matter Covered: The exponential family and link/variance functions, deviance, analysis of binary data (Binary/Binomial regression), overdispersion, ordinal/nominal polytomous data regression, Poisson regression, negative binomial regression, zero-inflated Poisson, quasiliikelihood, Gamma regression, GLM diagnostics, functional regression.

Language Used: R

MA565: Mathematical Models in the Life Sciences

Department: Mathematics

Instructor: Remus Osan (post-doctoral student)

Grade: A

School: Boston University, College of Arts and Sciences

Text Used: *Mathematical Models in Biology*. By Edelstein-Keshet. © 2005

Subject Matter Covered: Linear difference equations, nonlinear difference equations, linear ordinary differential equations, stability analysis, dimensional analysis, qualitative analysis methods, predator-prey systems, epidemiological models, chemical reactions.

BS850: Statistical Methodology in the Computational Biosciences

Department: Biostatistics

Instructor: Mayetri Gupta

Grade: A

School: Boston University, School of Public Health

Supplementary Texts Used: *Monte Carlo Strategies in Scientific Computing*. By Jun S. Liu. © 2004. *Bayesian Data Analysis*. By Gelman, Carlin, Stern, and Rubin. © 2004

Subject Matter Covered: Basics of Bayesian modeling and computing methods, optimization, Metropolis-Hastings theorem/algorithm, iterative sampling methods and missing data problems, the EM algorithm, global/local sequence alignment and dynamic programming methods, multiple sequence alignment, Hidden Markov models, motif discovery, variable selection (LASSO, LARS, SSVS), the evolutionary Monte Carlo algorithm, mixture models and cluster analysis, tempering/annealing, phylogeny and molecular evolution, modeling and prediction RNA and protein structure.

Language Used: R