

The Statistics Department at The George Washington University will offer the following Graduate Courses in Fall 2007 (September 4 – December 21, 2007) at the main campus.

Enhance your statistical analysis skills by taking one or more of these courses. Registering as a non-degree student is easy - please visit www.gwu.edu/~regweb for relevant information.

For questions or further information please contact Dr. Reza Modarres, e-mail: reza@gwu.edu, ph: 202-994-6888.

**Statistics 201-10. Mathematical Statistics. Thursday, 6:10pm-8:40pm.
Instructor: Dr. S. Balaji.**

**Statistics 201-11. Mathematical Statistics. Monday, 6:10pm-8:40pm.
Instructor: Dr. S. Balaji.**

This is the first part of a two-part graduate level series in Mathematical Statistics. The objective of the course is to introduce students to the concepts of probability that are useful for understanding statistical theory (the course continues on to Stat 202 in Spring, which deals with the theory of statistical inference). Topics to be covered in Stat 201 include basics of probability theory (including conditional probability, Bayes theorem, random variables, density and mass functions), univariate transformations, expected value, moment generating function, common probability distributions (including binomial, normal, uniform), multivariate distributions and transformations, covariance, inequalities and sampling distributions. This is roughly chapters 1 through 5 of the text: *Statistical Inference* (2nd Ed.) by Casella, G. and Berger, R. L.; Duxbury Press, CA.

This course is required for MS and Ph.D. students in Statistics, and Biostatistics, and Ph.D. students in Epidemiology. Students from other quantitative fields such as Economics, Finance, Engineering etc. would also find the course very useful and are encouraged to join. Prerequisites: Multivariable Calculus (Math 33), and Linear Algebra (Math 124) or equivalent.

**Statistics 214. Applied Linear Models. Wednesday, 6:10pm-8:40pm.
Instructor: Dr. E. Bura.**

Data arising from both experimental and observational studies and in a range of applications e.g. biomedical, pharmaceutical, social science, business, reliability etc. can be typically analyzed using linear models. Applied Linear Models is an applied course aiming to provide the methodological background and computational tools for data analysis. Topics covered: Definition, fitting, inference, interpretation of results, meaning of regression coefficients, lack of fit, multicollinearity, ridge regression, principal components regression, variable selection, diagnostics, transformations, influential observations, robust procedures, ANOVA, randomized block and factorial designs. Generalized Linear Models: Binary and binomial response data, logistic regression.

Textbook: Neter, Kutner, Nachtsheim and Wasserman (1996), Applied Linear Statistical Models.

Computing: The statistical software package R will be used. R is free with Windows, Macintosh and Unix versions. Prior experience with the software is not necessary.

Prerequisites: Multivariable Calculus (Math 33), and Linear Algebra (Math 124) or equivalent.

Statistics 227. Survival Analysis. Wednesday, 6:10pm-8:40pm.

Instructor: Dr. Z. Li.

This course will discuss parametric and nonparametric methods for the analyses of events observed in time (survival data). Topics include: survival distributions, Kaplan-Meier estimate of survival functions, Greenwood's formula, Mantel-Haenszel test, logrank and generalized logrank tests, Cox proportional hazards model, parametric regression models, and power and sample size calculations for survival analysis.

Prerequisite: Stat 201-2 or permission of instructor.

Stat 231. Categorical Data Analysis. Tuesday, 6:10pm-8:40pm.

Instructor: Dr. S. Kundu.

The purpose of this course is to provide a broad overview of the statistical procedures for analyzing categorical data. We will begin with analysis of contingency tables. We will talk about traditional methods for two-dimensional tables and then generalize to multidimensional tables. Theoretical bases underlying the analysis of categorical data will be covered. Different topics will include measures and tests of association; Cochran-Mantel-Haenszel procedure; weighted least squares and maximum likelihood estimators in generalized linear models; estimating equations; logistic regression; loglinear models. Computer applications (using SAS) will be considered.

Prerequisite: Stat 201-2.

Text: Categorical Data Analysis, 2nd Edition, by *Alan Agresti*, Wiley.

Statistics 257. Probability. Wednesday, 6:10pm-8:40pm.

Instructor: Dr. H. Mahmoud

This course will discuss rigorous modern measure-theoretic probability. No prior knowledge of measure theory is assumed; the necessary concepts will be developed as necessary. Topics to be covered include: Sigma fields and Probability measures, Probability Axioms, Lebesgue integration and expectation, Measure-theoretic independence, Borel-Cantelli Lemmas, Modes of probabilistic convergence, Weak and strong laws of large numbers, and Central limit theorems.

Students wishing to move on to the next level of sophistication and mathematical maturity needed for study in fields such as stochastic processes, statistics or advanced applications will find this course useful. Prerequisite: Stat-201 (MS level course in probability).

Textbooks: Karr, A. (1993). *Probability*. Springer, New York.

Supplemental Texts: Chung, K. (1974). *A Course in Probability Theory*. Academic Press, Orlando.
Billingsley, P. (1990). *Probability and Measure*, 2nd Edition. Wiley, New York.

Statistics 263. Advanced Statistical Theory I. Tuesday, 6:10pm-8:40pm.
Instructor: Dr. S. Bose.

This is an advanced course on principles and theory of statistical inference. Topics include: sufficiency, ancillarity, completeness, unbiased estimation, Cramer-Rao inequality, Bayesian estimation, admissibility, hypotheses testing.

Prerequisite: Stat 201-2 or permission of instructor.

Stat 265. Multivariate Analysis. Thursday, 6:10pm-8:40pm.
Instructor: Dr. R. Modarres.

This course will present mathematical theory of some statistical methods for analyzing multivariate data. Topics to be covered include: characterizations and properties of multivariate normal distribution, multiple correlation, partial correlation, estimation of the mean vector and the covariance matrix, Wishart distribution, Hotelling's T^2 distribution and its applications in hypotheses testing, discrimination and classification, and multivariate analysis of variance. Prerequisite: Stat 201-2.

Statistics 287. Modern Theory of Survey Sampling. Tuesday, 6:10pm-8:40pm.
Instructor: Dr. P. Chandhok

The main objectives of the course are to provide a rigorous treatment of sampling theory and its applications. With this background the student can modify the existing theory, develop new theory, and better understand its applications. Graduate students from quantitative fields such as Statistics, Mathematics, Economics, Finance and Engineering as well as professionals working in government and private-sector companies, with an interest in survey sampling will benefit from this course. The prerequisites for the class are Statistics 91 (Principles of Statistical Methods) or equivalent and Math 32 (Single-Variable Calculus) or equivalent.

This course will introduce the following topics: simple random sampling with and without replacement, systematic sampling, unequal probability sampling with and without replacement, ratio estimation, difference estimation and regression estimation.

Statistics 289-10. Reliability and Risk Analysis. Wednesday, 6:10pm-8:40pm.
(scheduled); however, the instructor is open to consider an alternative day and time, including Saturdays.
Instructor: Dr. N. Singpurwalla

The methods of reliability theory and of life testing provide a mathematical foundation and a statistical technology for survival analysis and for risk analysis. The aim of this course is to provide an overview of this technology from a modern Bayesian perspective. This material is summarized in a recent book written by the instructor, and the course will be based on the material therein. Topics to be covered will be: the quantification of uncertainty, the notion of exchangeability and its role in life data analysis and model building. Univariate and multivariate models for describing the failure of units and systems with interdependent and cascading failures. The elicitation and codification of expert testimonies in reliability and survival analysis. Stochastic process models for dynamic environments, competing risks, and multiple time scales. The course will conclude with a discussion on the relevance of the above to financial mathematics and financial risk.

The course material should be of interest to those interested in risk analysis, engineering reliability, applied probabilists, statisticians, biostatisticians and survival analysts, and those in mathematical finance.

Prerequisites: Stat. 201 – 202 or mathematical maturity and permission of the instructor.

Book: Reliability and Risk: A Bayesian Perspective, by N. Singpurwalla. John Wiley (2006).

Stat 289-11: Statistical Issues in Legal Setting. Monday, 6:10-8:40pm.

Instructor: Dr. J. L. Gastwirth

Although statistical data were presented to courts in the 1800's, the use of statistical inference and methods in the legal and regulatory context has increased dramatically during the last thirty years. Formal hypothesis testing of data on the racial composition of juries only became the accepted analytic approach in the United States in 1977. Since then, statistical information is used to examine employment data for age, race or sex discrimination in hiring, promotion and salary litigation. The increasingly global economy has raised legal issues concerning trademark infringement, anti-trust violations and whether a country is "unfairly" subsidizing its manufacturers of a product. Public concern with environmental safety created the need for governments to establish "safe" levels of chemicals and to determine whether exposure to a chemical or drug can be harmful. This seminar will discuss the use of statistical analysis in several of the above areas. The need to check the validity of the assumptions underlying commonly used methods and the role of sensitivity analysis to assess the impact of modest violations of those assumptions on the ultimate inference will be emphasized. In the second half of the semester students will present a summary of the statistical issues in a case from the area of law or policy they are interested in.