UTD	**Course**	**STAT 7334.501 Nonparametric and Robust Statistical Methods**
	Professor	Robert Serfling
	Term	Spring 2007
	Meetings	TR 7-8:15 pm (*subject to change*), CB 1.122

Professor's Contact Information

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Other Information	I check my *email* much more regularly than my telephone.

General Course Information

Prerequisite	*STAT 6331* or the equivalent is required.
Course Description	*Tentative Topics to be Covered*: Order Statistics. The ``Equal in Distribution" Technique. Distribution-Free Statistics. Count Statistics. Rank Statistics. Statistics using Both Counting and Ranking. Basic Theory of U-Statistics. Asymptotically Nonparametric Distribution-Free Statistics. Power Functions and their Properties. Nonparametric Alternatives. Pitman Asymptotic Relative Efficiency and Efficacy of Tests. Efficacies and A.R.E.'s in Location Testing Problem. Distribution-Free Confidence Intervals. Hodges-Lehmann Estimates and their Properties. M-Estimation for Location. Estimators as Functionals. Influence Curves. Linear Rank Statistics and their Asymptotic Null Hypothesis Distribution Theory. Locally Most Powerful Tests for the Two-Sample Location and Scale Problems and for General Regression Alternatives. Asymptotic Power of LMP Tests for Regression Alternatives. LMP Rank Tests and Asymptotic Properties for the One-Sample Location Problem. Conditional Nonparametric Distribution-Free Tests. Robust Statistics: History, Concepts, Methods. Robust Estimation: Methods, Stability Aspects, Jackknifing, Studentization. Robust Statistical Models: Formulation Issues, Estimation Criteria, Bias Versus Asymptotic Variance. Robust Estimation: Asymptotic Minimax Theory. Robust Estimation: Maxbias Curves. Robust Confidence Limits. Robust Estimation via Generalized L-Statistics. Nonparametric and Robust Density Estimation. Nonparametric and Robust Regression Estimation. Nonparametric Smoothing. Bootstrap Methods. Maximum likelihood estimation for nonparametric families. Multivariate symmetry. Nonparametric methods for multivariate location models. Multivariate sign and signed rank statistics. Multivariate depth and quantile functions. Notions of breakdown point.
Desired Learning Outcomes	A working knowledge of *nonparametric statistical methods*, which are designed to analyze data without relying on specification of an underlying parametric model, and *robust statistical methods*, which are designed to analyze data from a specified parametric model while minimizing the undue influence of contamination and outliers.
Required Text	No text will be specified as required. Lectures will be from the

	professor's notes accompanied by handouts. Readings from various books and journal articles will be assigned or recommended.
Suggested Texts, Readings, & Materials	Hettmansperger, T. P. and McKean, J. W., *Robust Nonparametric Statistical Methods*, Wiley, 1998 Huber, P. J., *Robust Statistical Procedures*, SIAM, 1977 Huber, P. J., *Robust Statistics*, Wiley, 1981 Haerdle, W., *Applied Nonparametric Regression*, Cambridge University Press, 1990 Randles, R. and Wolfe, D. A., *Introduction to the Theory of Nonparametric Statistics*, Wiley, 1979 Rousseeuw, P. J. and Leroy, A. M., *Robust Regression and Outlier Detection*, Wiley, 1987 Serfling, R. J., *Approximation Theorems of Mathematical Statistics*, Wiley, 1980 Various other sources will be suggested during the course.

Course Policies

Grading Criteria	The course grade will be based on *homework* (30%), a closed-book *midterm test* (30%), and the final exam (40%). Some homework assignments will be for written submission, some will be for classroom presentation. The final exam will involve preparation, under supervision of the instructor, a 20-minute presentation to the class on an assigned research paper. The presentations will be given together as a ``mini-symposium".
Missed Exam or Late Homework	In the case of a missed midterm exam, a makeup exam (either written or oral) will be conducted if the absence is excused. In the case of late homework, a penalty will be applied unless the lateness is excused.

Student Conduct and Discipline	The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of university business. It is the responsibility of each student to be knowledgeable about those which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, provided to all registered students each academic year.
Academic Integrity	The faculty expects from students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student, each student must demonstrate a high standard of individual honor in his or her scholastic work. Scholastic dishonesty includes, but is not limited to, statements, acts, or omissions that are related to the submission as one's own work of material that is not one's own. This may include cheating,

	plagiarism, collusion, and falsifying of academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.
Email	The University of Texas at Dallas encourages faculty to consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individuals corresponding and in the security of the transmitted information. UTD furnishes each student with a free email account, and the Department of Information Resources at UTD provides a method for students to forward their UTD email to other accounts.
Withdrawal	Deadlines for withdrawal from courses are published in each semester's course catalog. A faculty member cannot drop or withdraw a student. Rather, it is the student's responsibility to handle withdrawal procedures from any class. The proper paperwork and procedure must be used to avoid receiving a final grade of "F" in a course in which the student remained enrolled but did not participate.

Incomplete Grades	As per university policy, incomplete grades are granted only in the case of work unavoidably missed (and excused) by the semester's and not already covered by the professor's policy on missed work or activities, and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight weeks from the first day of the subsequent long semester. Otherwise the incomplete grade becomes changed automatically to the grade of F.
Disability Services	Disability Services seeks to provide students with disabilities educational opportunities equivalent to those of their non-disabled peers. The Office of Disability Services is located in room 1.610 in the Student Union, and its hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. Essentially, the law requires colleges and universities to make reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally, an assignment requirement may be modified (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes including students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance. It is the student's responsibility to notify his or her professors of the need for such accommodations. Disability Services provides students with letters to present to faculty members.
Religious Holy Days	The University of Texas at Dallas excuses students from class or other required activities for the purpose of travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated. In the case of such an absence, the student is encouraged to notify the instructor as soon as possible, preferably in advance. Regarding missed assignments, quizzes, tests, or exams, the student excused for such a purpose will be covered by the professor's policy for missed or late work.

COURSE SCHEDULE -- STAT 7334 -- Spring 2007 (subject to revision)

1/8-1/12	The setting and roles of nonparametric and robust inference. Order statistics and sufficiency. Nonparametric families of distributions. The "Equal in Distribution" technique.
1/15-1/19	Distribution-free statistics. Counting and sign statistic methods. Ranking methods. The Wilcoxon rank sum statistic.
1/22-1/26	Statistics using both counting and ranking. Wilcoxon signed rank statistic. Convergence theory. U-statistics and their applications, I.
1/29-2/2	U-statistics and their applications, II. Power functions and their properties. Comparison of mean, sign, and signed rank procedures. Formuation of nonparametric alternatives to null hypotheses.
2/5-2/9	Role of central limit theorem to approximate the power of a test statistic at local alternatives. Pitman asymptotic relative efficiency. The Pitman-Noether theorem.
2/12-2/16	Efficacy of tests. Efficacy of the signed rank test. Asymptotic relative efficiencies in location problems. Nonparametric distribution-free confidence intervals. Estimators associated with distribution-free test statistics. Hodges-Lehmann estimators.
2/19-2/23	M-estimation – location parameter. Linear rank statistics.
2/26-3/2	Two-sample location and scale problems. Regression problems. Robust estimation. *Take-home midterm test.*
3/5-3/9	***Spring Break*** ☺
3/12-3/16	Adaptation. Minimax theory for robust M-estimation of location.
3/19-3/23	.Robust confidence limits. Generalized L-statistics, I.
3/26-3/30	Generalized L-statistics, II. Nonparametric density estimation
4/2-4/6	Nonparametric regression estimation. Maximum likelihood estimation for nonparametric families.
4/9-4/12	Multivariate symmetry. Nonparametric methods for multivariate location models.
4/16-4/20	Multivariate sign and signed rank statistics. Multivariate depth and quantile functions. Notions of breakdown point.
4/23-4/27	**Final Exam: Mini-Symposium**