



STATISTICS 523 "NONPARAMETRIC STATISTICS"

Calendar Description: H(3-0)

Nonparametric estimation and tests of hypotheses. Distributions useful to handle nonparametric inference. Distribution-free tests. Asymptotic Theory.

Prerequisite: Mathematics 323 and 353; or consent of the Division.

Suggested Text: E.L. Lehmann, "Nonparametrics: Statistical Methods Based on Ranks", McGraw-Hill, New York, 1975. The linear rank statistic material is from the book by Randles & Wolfe. The timing is very much book-dependent. Note the 20 hours devoted to the two independent samples problem.

Syllabus

<u>Topics</u>	<u>Number of Hours</u>
Introduction: parametric versus nonparametric theory; the sign test	1
Wilcoxon rank-sum test. Deriving the null distribution, p-values	2
Symmetry of the distribution; equivalence to the Mann-Whitney test (proofs), derivation of the mean and variance; asymptotic normality (proof later)	4
Treatment of ties; two-sided alternatives, tests for variability (Siegel-Tukey), Smirnov's test	4
Population models; power of the Wilcoxon rank sum test; unbiasedness	2
Asymptotic power (normal example), power for local alternatives (normal example)	2
Comparison with the t-test, efficiency, Pitman efficiency	2
Estimation and confidence intervals for the treatment effect	2
Further two-sample results: Behrens-Fisher problem, normal scores test, efficiency	1
Paired samples; Wilcoxon signed-rank test, derivation of the null distribution, p-value derivation of the mean and variance, asymptotic normality (proof later), tied ranks	3
Combining data from different blocks*	2
Population models for paired comparisons, sign test (power), Wilcoxon signed-rank test (power), comparisons with the t-distribution, estimation of location	3
Kruskal-Wallis test, tied observations, normal scores, Kiefer's test	1
Friedman test, tied observations, dichotomous responses*, aligned ranks	2
Linear rank statistics, examples, asymptotic normality (proof)	5

* Optional topics