

STAT 500 - STATISTICAL METHODS

(4 hours per week)

Instructor: D. G. Bonett

Prerequisites: Introductory statistics, calculus, linear algebra

Text: Kutner, M.H., Nachtsheim, C.J. Neter, J. Li, W. (2005) *Applied Linear Statistical Models*, 5th ed. McGraw-Hill.

Part I. Basic Methods (weeks 1 - 5)

Populations, sampling, and random variables; univariate and bivariate expectations and moments; normal and binomial distributions; methods of estimation; univariate and bivariate sampling distributions; asymptotic results; estimation of mean (μ), standard deviation (σ), proportion (π), median (η) and correlation (ρ); confidence intervals and tests for μ , σ , π , η , and ρ ; tests and confidence intervals for $\mu_1 - \mu_2$, σ_1/σ_2 , $\pi_1 - \pi_2$, $\rho_1 - \rho_2$ and $\eta_1 - \eta_2$ from two independent samples; tests and confidence intervals for $\mu_1 - \mu_2$, σ_1/σ_2 , $\pi_1 - \pi_2$, $\rho_1 - \rho_2$ and $\eta_1 - \eta_2$ from paired samples; sample size requirements for confidence intervals and tests; assumptions and effects of violating assumptions. **1st Midterm Examination** (100 points)

Part II. Regression Analysis (weeks 6 - 10)

Tests and confidence intervals for y -intercept, slope, conditional mean, and disturbance variance; prediction intervals, inverse prediction, influential observations; diagnostic methods; multiple regression model, interpretation of model parameters, standardized coefficients; dummy variables, modeling interaction effects, polynomial regression; generalized least squares; sample size requirements for tests and confidence intervals; assumptions and effects of violating assumptions. **2nd Midterm Examination** (100 points)

Part III. Design and Analysis of Experiments (weeks 11 - 15)

Tests and confidence intervals for linear contrasts of means, proportions, and medians in single-factor experiments; classification factors; interpretation of main effects, interaction effects, simple effects; measures of effect size; randomized block and repeated measures designs; analysis of covariance; random coefficient models; point and interval estimates of variance components; sample size requirements for simultaneous tests and confidence intervals; assumptions and effects of violating assumptions.

Final Comprehensive Examination (week 16, 150 points)

Note: All examinations are closed-book/notes.