

STAT 302 – Statistics II

Fall 2007

1. Catalog Description

STAT 302 Statistics II (4)

Continued study of the process, concepts, and methods of statistical investigations. Association, chi-square procedures, one-way ANOVA, multiple comparisons, two-way ANOVA, interaction, simple linear regression, correlation, prediction, logistic regression, multiple regression, time series, forecasting, quality control. Substantial use of statistical software. Not open to students with credit in STAT 322. 4 lectures. Prerequisite: STAT 301.

2. Required Background and/or Experience

Completion of STAT 301 or equivalent.

3. Expected Outcomes

The student should be able to:

- a) understand statistical concepts related to issues of relationships between variables, such as association, causation, extrapolation, residual;
- b) develop deeper understandings of fundamental concepts of statistical inference, such as confidence, significance, power;
- c) perform descriptive and inferential analyses related to exploring relationships between variables, including chi-square, one-way ANOVA, two-way ANOVA, simple linear regression, logistic regression, and multiple regression;
- d) identify which statistical procedure applies for addressing a research question involving data;
- e) use computer software to analyze data and select appropriate statistical models for data;
- f) apply basic techniques of time series to make forecasts;
- g) apply quality control methods;

4. Text and References

Suggested Texts:

Chance, B., Rossman, A., *Investigating Statistical Concepts Applications and Methods*.
Thompson, Brooks Cole. 2006.

Navidi, W., *Statistics for Engineers and Scientists*, 2nd ed. McGraw Hill. 2008.

5. Minimum Student Materials

Computer access with Minitab and calculator for student use in preparing assignments and/or taking exams.

6. Minimum University Facilities

Chalkboard for instructional use, overhead projector, data projector.

Expanded Description of Content and Method

| <u>CONTENT</u> | <u>NUMBER OF LECTURES</u> |
|--|----------------------------------|
| A. CATEGORICAL VARIABLES | 4 |
| 1. Goodness of fit | |
| 2. Homogeneity (2×2 and $r \times k$) | |
| 3. Independence (2×2 and $r \times k$) | |
| B. ONE-WAY ANOVA | 4 |
| 1. The ANOVA model | |
| 2. Multiple comparisons | |
| 3. Requirements for validity | |
| 4. Randomized complete block | |
| C. TWO-WAY ANOVA | 4 |
| 1. The two-way model | |
| 2. Estimating and interpreting interactions | |
| 3. Interpreting main effects in the presence of interactions | |
| D. SIMPLE LINEAR REGRESSION | 4 |
| 1. Scatterplots and Correlation | |
| 2. Correlation t-test | |
| 3. Least squares and the regression model | |
| 4. Estimating and interpreting model parameters | |
| 5. The ANOVA identity and R-squared | |
| 6. Inference for model parameters | |
| 7. Confidence and predictions intervals | |
| 8. Outliers, leverage, and influential observations | |
| 9. Residuals: requirements for validity | |
| 10. Transformations | |
| E. MULTIPLE REGRESSION | 8 |
| 1. Multiple regression model and least squares | |
| 2. Multiple coefficient of determination and the global F-test | |
| 3. Inference for model parameters | |
| 4. Estimation and prediction | |
| 5. Residuals: requirements for validity | |
| 6. Interactions, dummy variables, polynomials | |
| 7. Partial F-test | |
| 8. Variable selection procedures | |
| 9. Multicollinearity | |
| F. QUALITY CONTROL | 6 |
| 1. Statistical control: common/special causes | |
| 2. Control charts for variables | |
| 3. Control charts for attributes | |
| 4. The CUSUM chart | |
| 5. Process capability | |
| G. TIME SERIES | 6 |
| 1. Components of time series | |
| 2. Exponential smoothing | |
| 3. Measuring forecast accuracy: MAD and MSE | |
| 4. Forecasting trends | |
| 5. Seasonal regression models | |
| 6. Auto-correlation and the Durbin-Watson test. | |
| Total | 36 |