Program Cover Document --- STA 305: Regression Analysis

I. Basic Course Information

STA 305 is a required upper level statistics course, both for statistics majors and statistics minors. It will be scheduled for two 80-minute lecture periods. It has STA 115 or STA 215 and MAT 125 or MAT 127 as prerequisites.

II. Learning Goals

The American Statistical Association's guidelines for undergraduate programs in statistical science state that such programs should "emphasize concepts and tools for working with data and provide experience in designing data collection and in analyzing real data that goes beyond the content of a first course in statistical methods." More specifically, they recommend that programs should provide statistical topics that include statistical modeling e.g. simple, multiple and logistic regression, and that programs should require familiarity with a standard statistical software package.

In statistical science the most important analytic tool for examining the relationships between two or more variables is regression analysis. It is, in essence, a statistical technique for developing an equation which describes the relationship between two or more variables and is applicable to all fields. For example, social researchers may inquire "Are changes in the unemployment rate associated with changes in the President's popularity at the polls?" Business researchers may want to know how much advertising is necessary to achieve a certain level of sales. Real estate companies may wish to investigate factors that explain variations in selling prices from house to house. These examples are all instances of statistical modeling.

STA 305 will equip students with skills in modeling that they can utilize and build on in flexible ways at both graduate school and in future employment. It will emphasize real data and authentic applications, and will present data in a context that is both meaningful to students and indicative of the field of science underlying the data. The course will encourage synthesis of theory, methods and application, and will include extensive experience with statistical computing. There will be frequent opportunities to develop communication skills through in-class presentations of project work involving analysis of data sets.

On completion of this course students should have achieved the following learning goals:

(i) A clear understanding of the theoretical development of statistical techniques.
(ii) The selection of appropriate techniques in given contexts.
(iii) The skills to apply statistical procedures to a wide variety of real-life problems.
(iv) The practice of assessing the reasonableness of analytic results.

(v) The ability to provide correct interpretations of results and to recommend appropriate decisions.

(vi) The possession of strong computing skills and familiarity with statistical software.

(vii) The possession of skills directed to the communication of statistical results to a variety of audiences.

III. Student Assessment

Students will receive regular feedback on their work through the assignment of homework, quizzes, student presentations and examinations. Through this feedback, students will be able to see and correct their misunderstandings and improve their performance. Student performance on these assessment instruments and the performance of students in their statistics options will be used to assess the success of Regression Analysis in achieving its learning goals and its contribution to the fulfillment of the MATC course program goals. Peer reviews and student evaluations will also be used to evaluate the course.

IV. Learning Activities

Learning activities will consist of a combination of lectures, group work, student presentations and computer assignments. The specific choice will depend upon the individual instructor. Outside class, students are expected to do a significant amount of individual and group homework to achieve the learning goals. These learning activities are typical of the learning activities in the MATA, MATT and MATC programs. By giving students a variety of ways and means to conduct statistical analyses, the learning activities promote a deeper understanding of the concepts of regression analysis and contribute to the learning goals of these programs.

STA 305: Regression Analysis
Course Syllabus

Section 1 MW 5.00 – 6.20 SCP 221

Textbook: Applied Regression Analysis by Terry Dielman (Duxbury)

Instructor: Dr David Holmes

Office: 205 Science Complex. Phone: 771 - 2164
E-mail: dholmes@tcnj.edu

Office Hours: 3.30 – 4.50 MW. 11.30 – 12.30 R.

Course Description:
This course will present regression concepts and techniques as a synthesis of theory, methods and applications. The emphasis is on understanding the assumptions of the regression model, knowing how to validate a selected model for these assumptions, knowing when and how regression might be useful in a variety of application areas, and understanding and interpreting output from statistical software packages such as SPSS. The analysis of data will be an important component of the learning process.

Syllabus: The following topics will be covered:

The simple linear regression model.
Inference in simple linear regression.
Analysis of variance.
Correlation.
Introduction to multivariate relationships.
Multiple regression.
Multiple correlation and R-squared.
Modeling interaction.
Partial correlation.
Binary explanatory variables.
Quadratic regression.
Logistic regression: modeling categorical responses.
Compound regression.

Most class sessions will mix instructional theory with practical applications and problem-solving. A statistical computer package will be used.

Calculators: Please bring these to every class and to all tests and examinations.

Evaluation: Three tests will be administered during the course, plus a final examination which will be comprehensive.
Each test will score **100** points.
The final examination will score **200** points.
Final grades will be computed on the basis of the total score obtained from the maximum available **500** points.

Homework: This will be set periodically and will be marked on a 1-5 scale.
The marks obtained will be recorded and will be taken into account in cases of borderline decisions between final grades. Late homeworks will not be accepted.

Policy:

(a) Absences
A student who is absent for a test will not be permitted to make up the test unless some arrangement has been made with me in advance. Approval for missing a test will be rare and based on truly exceptional circumstances. In the case of illness, a doctor's note will be required.

(b) Participation
Class participation is expected by way of thoughtful comments, questions, and a demonstration that you are prepared to respond in class when asked to do so.
Lecture sessions will sometimes not permit a great deal of class participation but problem-solving sessions will most certainly do so, as will sessions involving the use of statistical software and the interpretation of printout from these sessions.

Academic Honesty: Please make sure you are familiar with TCNJ's academic honesty policy. Any suspected violation of this policy will be confronted in strict accordance with the policy.

If you have any queries or concerns about the above, or think you will have difficulty attending class on a regular basis for some reason because of a commitment or appointment made prior to enrolling in the class, please bring this to my attention during the first two weeks of the semester.

DIH