Index #17-099
4/4/2017

NORMANDALE
COMMUNITY COLLEGE

Course Outline for: MATH 2080 Statistical Modeling

A. Course Description

1. Number of credits: 3
2. Lecture hours per week: 3
   Lab hours per week: None
3. Prerequisites: MATH 1080 or MATH 1090
4. Co-requisites None
5. MnTC Goals: Goal 4/Mathematical/Logical Reasoning

Catalog Description:

This course provides an introduction to statistical model building including simple linear regression, non-linear models, logistic regression, and multiple regression models. Optionally, an instructor may include an introduction to artificial neural net models. Examples of modeling problems will be used from a variety of disciplines and thus the course should be useful to students interested in physical sciences, biology, economics, finance, and data science.

B. Date last reviewed: 4/2017

C. Outline of Major Content Areas

A. Brief review of sampling distributions, confidence intervals and the logic of hypothesis tests.
B. Scatterplots and correlation coefficient for two quantitative variables.
C. Simple linear regression; confidence intervals and hypothesis testing regarding the slope, intercept, and correlation coefficient for a linear model.
D. Prediction and confidence intervals.
E. Exponential, power and logistic regression models.
F. Variable transformations in model creation.
G. Multiple linear regression and variable transformations.
H. Assumptions of non-colinearity, normality of residuals, and homoscedasticity.
I. An introduction to artificial neural net models (optional).

D. Course Learning Outcomes

Upon successful completion of the course, the student will be able to:

1. Construct confidence intervals, prediction intervals, and hypothesis tests for a variety of situations including simple linear regression. (Goals 2a, b; 4b, d)
2. Interpret confidence intervals, prediction intervals, and hypothesis tests for a variety of situations. (Goals 2a, b, c, d; 4a, b, d)
3. Select various non-linear models appropriate to a given problem, and to choose appropriate transformation of variables. (Goals 2a, b, c, d; 4a, b, d)

4. Interpret correlation coefficients and coefficients of determination for various models. (Goals 2a; 4b, d)
5. Discuss the assumptions of non-colinearity, normality of residuals, and homoscedasticity. (Goals 4a, b, d)
6. Using appropriate software, perform the creation of simple linear regression models, non-linear models, and multiple regression models. (Goals 2a, b, c; 4a, b, d)
7. Interpret and clearly communicate the results of a linear, non-linear or multiple regression model for its appropriateness and usefulness in a given context. (Goals 2a, b, c; 4a, b, d)
8. Critique the appropriateness of a particular modeling method for a given situation. (Goals 2a, c, d; 4a, b, d)
9. Using appropriate software, create and interpret the results of an artificial neural net model (optional). (Goals 2a, b; 4a, b, d)

E. Methods for Assessing Student Learning

The instructor may choose from a variety of methods to assess student learning, including homework assignments, exams, and a final exam. Projects involving statistical modeling are encouraged.

F. Special Information

Instructors are encouraged to use large data sets in the assessments and in-class examples, including data sets that require manipulation before model creation can be performed. Instructors are encouraged to use software packages such as Microsoft Excel and R.