

Prefix, Number and Name of Course: ACM 640 Linear Regression and Correlation

Credit Hours: 1

In Class Instructional Hours: 1 **Labs:** 0 **Field Work:** 0

Catalogue Description:

Prerequisite: MAT 202 or equivalent

Simple linear regression and correlation, multiple linear regression, multicollinearity, multiple and partial correlations, confounding and interaction, sequential methods of model selection.

Reasons for addition:

To create a one-semester-hour module for the graduate Professional Applied and Computational Mathematics program where students will formulate and solve real life problems in various settings using regression analysis, a statistical tool that utilizes the relationship between a response variable and one or more predictor variables for the purposes of description, prediction and/or control.

Student Learning Outcomes: Students will:	Content Reference:	Assessment:
1. demonstrate the ability to fit simple and multiple regression models to real-life data and test for the appropriateness of the model.	I; II. A-E, I, J; III	Individual homework assignments, group work, examinations and computer projects.
2. compute and interpret simple, multiple, and partial correlation coefficients.	I. H; II. F, H; III	Individual homework assignments, group work, examinations and computer projects.
3. compare and contrast confounding and interaction.	II. G; III	Individual homework assignments, group work, examinations and computer projects.
4. demonstrate an understanding of the problem of multi collinearity and the sequential methods for model selection.	II. H, K; III	Individual homework assignments, group work, examinations and computer projects.
5. demonstrate an understanding of how statistical software can be used in the field.	III.	Individual homework assignments, group work, examinations and computer projects.

Course Content:

- I. Simple linear regression and correlation
 - A. Least squares and the fitted model
 - B. Properties of the least squares estimators
 - C. Inferences concerning regression coefficients

- D. Prediction
 - E. Analysis of variance approach
 - F. Diagnostic plots of residuals
 - G. Transformation of data
 - H. Correlation
- II. Multiple linear regression
- A. Estimation of coefficients
 - B. Properties of least squares estimators
 - C. Analysis of variance in multiple regression
 - D. Inferences in multiple linear regression
 - E. Study of residuals and violation of assumptions
 - F. Correlations: multiple, partial, and multiple-partial
 - G. Confounding and Interaction
 - H. Multicollinearity
 - I. Categorical or Indicator variables
 - J. Polynomial regression
 - K. Sequential methods for model selection
- III. Use of statistical software

Resources

Scholarships in the Field:

- Allen, M. P., *Understanding Regression Analysis*, New York: Plenum Press, 1997.
- Brook, R. L. and Arnold, G. C., *Applied Regression Analysis and Experimental Design*, Dekker 1985.
- Darlington, R. B., *Regression and Linear Models*, New York: McGraw Hill, 1990.
- Draper, N. R. and Smith, H., *Applied Regression Analysis*, 3rd edition, Wiley 1998.
- Fox, J., *Applied Regression Analysis and Generalized Linear Models*, 2nd ed., CA: Sage, 2008.
- Freund, R. J., Wilson, W. J. and Sa, P., *Regression Analysis*, Elsevier, 2006.
- Glantz, S. and Sinker, B. K., *Primer of Applied Regression and Analysis of Variance*, 2nd ed., New York: McGraw-Hill, 2001.
- Harell, F. E. Jr., *Regression Modeling Strategies*, New York: Springer-Verlag, 2001.
- Hocking, R. R., *Methods and Applications of Linear Models: Regression and Analysis of Variance*, 2nd ed., N.J: Wiley-Interscience, 2003.

Kleinbaum, D. G., Kupper, L. L. and Muller, K. E., *Applied Regression Analysis and other Multivariable Methods*, 3rd edition, Duxbury Press 1998.

Mason, R. L., Gunst, R. F. and Hess, J. L., *Statistical Design and Analysis of Experiments: with Applications to Engineering and Science*, 2nd edition, John Wiley 2003.

Mickey, R. M., *Applied Statistics: Analysis of Variance and Regression*, 3rd edition, Wiley-Interscience 2004.

Montgomery, D. C., *Introduction to Linear Regression Analysis*, 2nd ed., New York: Wiley 1992.

Neter, J., Wasserman, W. and Kutner, M. H., *Applied Linear Statistical Models*, 4th edition, Richard D. Irwin 1996.

Rao, C. R., *Linear Statistical Inference and its Applications*, 2nd edition, Wiley Eastern 1973.

Seber, G. A. F., *Linear Regression Analysis*, John Wiley & Sons 1977.

Seber, G. A. F. and Lee, A. J., *Linear Regression Analysis*, NJ: Wiley, 2003

Sen, A. and Srivastava, M., *Regression Analysis: Theory, Methods, and Applications*, New York: Springer-Verlag, 1997.

Vittinghoff, E., Glidden, D. G., Shiboski, S. C. and McCulloch, C. E., *Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models*, New York: Springer-Verlag, 2005.

Weisberg, S., *Applied Linear Regression*, 3rd edition, Wiley-Interscience 2005.

Wilson, W. J., *Regression Analysis: Statistical Modeling of a Response Variable*, CA: Academic Press, 1998.

Periodicals:

Annals of Applied Statistics

Annals of Mathematical Statistics

Annals of Statistics

Biometrics

Biometrika

Communications in Statistics

Demography

International Statistical Review

Journal of the American Statistical Association

Journal of Applied Statistics

Journal of Applied Statistical Science

Journal of Statistical Computation and Simulation

Journal of the Royal Statistical Society

Scandinavian Journal of Statistics
Statistics in Medicine
Statistical Methods in Medical Research
Technometrics
The American Statistician

Electronic and/or Audiovisual Resources:

Electronic Journal of Statistics

Link to electronic journals web site (<http://www.e-journals.org/>)