NOVA SCOTIA AGRICULTURAL COLLEGE
Department of Business and Social Sciences
Course Outline
Mathematical Programming for Applied Economic Analysis

Module I: September
Module II: October
Module III: November
The actual times and days of the week will be determined jointly with the student/students.

Depending on the background and interest, a student may be able to take each module independently of each other.

Instructor: Dr. Emmanuel K. Yiridoe
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Office Hours:
Monday: 15.00-16.00
Wednesday: 15.00-16.00

Pre-requisites: Undergraduate ECON4000: Advanced Microeconomics (or equivalent), or in consultation with and approval by instructor.

Objectives: The course will introduce students to advanced economic optimization techniques and modeling, with applications to agricultural and natural resource economics problems. After completing this course the student will be able to: 1) identify, develop and formulate advanced optimization problems; and ii) solve numerical optimization problems using spreadsheet and other optimization software. In addition, students will be introduced to applications of various optimization models in agricultural and resource economics. Emphasis will be placed on mathematical optimization problem identification, mathematical model formulation and solution, and interpretation of model results.

Evaluation: For each module, final grade will be based on:

i) 1 assignment [20%]; **and**
ii) Student to choose between a take home exam **OR** a term paper [80%]

The term paper may involve theoretical economic optimization modeling or empirical analysis of an optimization problem related to agricultural or resource economics.

Recommended Texts:

Beneke, R.R., and R. Winterboer. 1973. *Linear Programming: Applications to Agriculture*. Ames: Iowa State University Press.

Ragsdale, C.T. 2008. *Spreadsheet Modeling and Decision Analysis*, 5th Edition. South-Western, Thomson.

Other References:

Anderson, J.R., J.L. Dillion and B. Hardaker.1977. *Agricultural Decision Analysis*. Iowa State Press.

Bender, F.E., G. Kahan and W.C. Mylander. 1992. *Optimization for Profit: A Decision Maker's Guide to Linear Programming.* The Haworth Press.

Dorfman, Robert, Paul A. Samuelson, and Robert M. Solow. 1987. *Linear Programming and Economic Analysis*. New York: Dover Publications, Inc.

Hardaker, J.B., R.B.M. Hurine, J.R. Anderson, and G. Lien. 2004 *Coping with Risk in Agriculture*. Second Edition. CABI.

Hazell, P.B.R. and R.D. Norton. 1986. *Mathematical Programming for Economic Analysis in Agriculture*. Macmillan.

Paris, Q. 1991. *An Economic Interpretation of Linear Programming*. Ames: Iowa State University Press.

Schaffer, William A.1999. *Regional Impact Models: A WebBook*. Regional Research Institute, West Virginia University.

Winston, Wayne L. and S. Christian Albright**.** 2001. *Practical Management Science: Spreadsheet Modeling and Applications*, 2nd Edition, Duxbury Press, 2001.

Taha, H. A. Year. *Operations Research: An Introduction. Fourth edition*. (New York: Macmillan Publishing Co., Inc..

Journal Articles:

D.J. Caine, and B.J. Parker. 1996. Linear programming comes of age: a decision-support tool for every manager. Management Decision, Vol. 34 Iss: 4, pp.46 - 53

Course/Module Outline

Module I: Introduction to Optimization and Linear Programming

1.1 Evolution of decision analysis and optimization techniques

1.2 Introduction to Optimization and LP
- 1.2.1 The MP approach
- 1.2.2 Linear Programming and assumptions
- 1.2.3 LP theory: matrix solution and interpretation
- 1.2.4 Solving basic LP problems using MS Excel SOLVER
- 1.2.5 Techniques for formulating basic LP problems
- 1.2.6 Duality and sensitivity analysis: and basic relaxation of LP assumptions

Module II: Applications of Mathmatical Programming Techniques

2.1Survey of the construction of MP models (Beneke & Winterboer: ch 3)

2.2 Multiple objective LP problems (Ragsdale: ch 7)

2.3 Risk analysis and simulation.

Module III: Advanced Topics in MP

2.1 Transshipment and Transportation Models

2.2 Goal Programming

2.3 Integer Linear Programming

2.4 Dynamic Programming models

2.5 Nonlinear Programming