Application of Quantitative Analysis in Business and Economic Analysis

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Instructors:PingSun Leung, University of Hawaii at Manoa
(psleung@hawaii.edu; http://www.ctahr.hawaii.edu/LeungP/)
Parashqevi Rrapo, Agricultural University of Tirana
(parashqevi.rrapo@gmail.com)

Course Description:

Introduction to quantitative decision-making methods for effective agribusiness management in resource allocation, scheduling, logistics, risk analysis, inventory, and forecasting. Emphasis on problem identification, model formulation and solution, and interpretation and presentation of results. Prerequisites: Introductory economics and statistics.

Course Objectives: This is a <u>spreadsheet modeling</u> course introducing modern management science techniques for economic and business decision analysis. It is an applied management science course for MS students focusing on agribusiness management and the use of spreadsheet models for analysis. The overall goals are:

- to provide an introductory survey of modern management science techniques that can assist economists, agribusiness/business managers and industry analysts to make sound business and economic decisions;
- (b) to develop practical knowledge and hands-on experience in solving common economic and management problems faced by agribusiness/business firms;
- (c) to gain proficiency in formulating and implementing problems in a computer model with emphasis on spreadsheet model;
- (d) to generate information for decision making from computer models and to evaluate the information provided to improve decision making.

Skills and Knowledge to be Acquired:

Business management and economic decision analysis is the essence of this course. Students will come to understand and apply modern management science techniques for sound decisionmaking in resource allocation, scheduling, logistics, risk analysis, and inventory control. Students will learn to formulate and solve problems utilizing several MS Excel decision analysis add-ins. Most examples of the applications of management science concepts and techniques introduced in lectures and utilized in computer assignments will be from scaled-down 'real world' case studies.

Required Text:

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

Reference Texts:

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

- Bender, F.E., G. Kahan and W.C. Mylander. *Optimization for Profit: A Decision Maker's Guide to Linear Programming.* The Haworth Press, 1992.
- Hardaker, J.B., R.B.M. Hurine and J.R. Anderson. Coping with Risk in Agriculture. CABI, 1997.
- Hazell, P.B.R. and R.D. Norton. <u>Mathematical Programming for Economic Analysis in Agriculture</u>. Macmillan, 1986.
- Rae, A.N. Agricultural Management Economics. CAB International, 1994.

Course Organization and Administration:

Homework will be assigned for each daily session which will not be graded but students are expected to participate in the discussion of the solution in the following session. There will be an in-class midterm and a take-home final exam for the course.

Course Outline:

- **Day 1:** Introduction to Modeling & Decision Analysis, <u>Chapter 1</u> Introduction to Optimization & Linear Programming (LP), <u>Chapter 2</u>
- Day 2: Modeling & Solving LP in a Spreadsheet Using Excel SOLVER
 LP Applications Make vs. Buy Decisions; Investment Problems, Transportation;
 Blending, Production & Inventory Planning, Multi-Period Cash Flow Analysis, <u>Chapter 3</u>
- Day 3: LP Sensitivity Analysis Duality, Sensitivity Report, Shadow Price, Reduced Costs, Spider Plot, Solver Table, <u>Chapter 4</u>
- Day 4: Data Envelopment Analysis (DEA) and Efficiency Analysis, Chapter 3.14
- Day 5: Network Models Shortest Path Problem; Equipment Replacement, Maximal Flow; Minimal Spanning Tree, <u>Chapter 5</u> Integer Programming Models - Employee Scheduling: Budgeting, Eived Charge Prob

Integer Programming Models - Employee Scheduling; Budgeting, Fixed Charge Problem; Minimum Order/Purchase Size; Quantity Discount, <u>Chapter 6</u>

- Day 6: Midterm Exam; Integer Programming Models continued, Chapter 6
- Day 7: Goal Programming and Multiple Objective Programming Models, Chapter 7
- Day 8: Nonlinear programming Models Economic Order Quantity, Location Models, Optimize Financial Spreadsheet, Portfolio Selection (Risk Programming Models), EVOLUTIONARY SOLVER, <u>Chapter 8</u>
- Day 9: Risk Analysis and Simulation RISK SOLVER, Chapter 12
- Day 10: Decision Analysis Decision Trees, Value of Perfect Information, Utility Theory, Analytic Hierarchy Process, WebAIM, <u>Chapter 15</u>

Some Useful Web-sites:

Cliff Ragsdale's Text Web-site <u>http://www.thomsonedu.com/decisionsciences/ragsdale</u> Institute for Operations Research and Management Sciences (INFORMS) [General and will lead to many other useful web-sites] <u>http://www.informs.org/</u> Frontline Systems <u>http://www.solver.com</u>

An Introduction to Linear Programming and the Simplex Algorithm by Spyros Reveliotis Online Course by Dr. H. Arsham

http://home.ubalt.edu/ntsbarsh/opre640online/OPRE640ONLINE.HTM Other OR/MS Online Courses <u>http://www2.informs.org/Resources/Courses/</u>