AGEC 641:
3 Credits Spring 2003

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Purpose: To introduce students to mathematical programming, emphasizing modeling, interpretation and complete problem analysis.

Conduct: Each week we will have 2 hours lecture in room 155 and 1 hour of lab in 307

Grading
Homework, GAMS projects and Lab assignments 25%
One Midterm 30%
Final exam 35%
Instructor 10%

Homework and GAMS Projects:
Homework and GAMS project assignments will be given. The assignments will be individual or group efforts as specified when the assignment is made. Late assignments will be penalized one letter grade per class period (in the absence of a decent excuse).

More on GAMS Projects:
Groups of students will complete several projects using GAMS. These will be based on a model falling into: transportation, business management, water use, processing, marketing or other instructor approved area. Students will
a) pick a problem.
b) set up and solve two LP examples using GAMS (can include one of those in the course notes).
c) set up and solve aversion where risk is included.
d) set up and solve aversion where nonlinear terms reflecting increasing cost, demand or supply are included.
e) set up and solve a version with an integer based investment

Laboratory: There will be required laboratory meeting once a week on Friday. During this lab material will be presented on GAMS usage. In addition the lab may review elements of the course like homeworks or tests plus respond to student questions.

Test: One test will be given - at the end of Linear Programming. The test will consist of two parts - one part in class and one part out of class due the next day. The out of class part is individual, not group effort.

Final: The final exam will be cumulative emphasizing use of mathematical programming.

Prerequisite: Students are expected to have elementary linear programming training including the simplex method and duality. Matrix Algebra knowledge is also essential. Attend 622 to help correct deficiencies. (TTH 9:35 - 10:50 a.m. in room 457)
Course Description

AgEc 641 is a course on applied mathematical programming. The course will concentrate on the formulation and interpretation of mathematical programs utilizing multiple objective, quadratic, integer, dynamic, and general nonlinear programming.

Students for Whom the Course is Intended

The course is intended for Masters and Ph.D. level students. Those entering the course should have previous background in linear programming and matrix algebra.

General Purpose

To instruct students in the practical use of mathematical programming as a tool in doing economic analysis and research. Algorithms will not be stressed as the instructor feels that economists are basically in a position of applying techniques rather than developing algorithms for techniques. Algorithms will be discussed only to the extent needed for interpretation of solution results. GAMS implementation will be a focus.

Learning Objectives

To provide students with basic knowledge of:

The Mathematical Programming Approach
Linear Programming
  Theory - Matrix Solution, Interpretation, Duality, and Sensitivity
  Formulation and Duality
  Applied Use
Multiple Objective Programming
Nonlinear Programming
Quadratic Programming
Risk Programming
Integer Programming
Model Validation
GAMS Usage

Grading: Grading in the course will be accomplished through a weighted scheme, which will consider homework, laboratory assignments GAMS projects, a mid-term, and a final exam

Textbooks: The course will be taught out of a draft text, Applied Mathematical Programming Using Algebraic Systems by Bruce A. McCarl and Thomas H. Spreen distributed through agecon.tamu.edu/faculty/mccarl.
Outline AGEC 641: Lecture Session

I. Introduction to Mathematical Programming

II. Linear Programming Matrix Solution, Interpretation, Duality, and Sensitivity - Chapter III

III. Linear Programming Model Formulation and Duality - Chapters 5-10


IV. Fixing Linear Programming Models - Chapter 17

MIDTERM

V. Multiple Objective Programming - Chapter 11

VI. Nonlinear Optimization Conditions - Chapter 12

VII. Quadratic Programming - Chapter 13

VIII. Risk Modeling - Chapter 14

IX. Integer Programming - Chapter 15, 16

X. Validation of Mathematical Programming Models - Chapter 18
Outline AGEC 641: Lab Session

I. Introduction to GAMS: Formulation of a simple problem

II. Introduction to GAMS-IDE & Hands on

III. Introduction to GAMS: Formulation of a general problem

IV. Model inspection & Error message

V. GAMS check

VI. Power of GAMS

VII. Good modeling practices

VIII. Report writing improvement

IX. Conducting comparative analysis
   IX.1. Use multiple GAMS submissions
   IX.2. Use GAMS loop procedure