AGEC 641: Operations Research Method in Agriculture
3 Credits Spring 2025
AGLS 109 TR 4:10-6:00 pm (will not always go that long)

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Office hours: open door policy; an appointment is recommended.

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

Conduct: Each week, we will have 2 lectures (including lab) in AGLS 109

Grading:

Homework	15%
Lab assignments	10%
One Midterm	30%
Final exam	35%
Instructor	10%

Most Important Things for This Class

Ask Questions!!! Previewing the lecture notes can help you follow the lecture.
The simplest question you can ask is "go back X pages and repeat it"

Homework and GAMS Projects:

Homework and GAMS lab assignments will be given. The assignments will be group efforts (no more than 3 people) as specified when the assignment is made. Late assignments will be penalized by one letter grade per class period (in the absence of a decent excuse).
The homework assignments are relatively heavy loads, especially for a couple of them near the midterm exam.

Laboratory:

There will be required laboratory meetings. During this, lab material will be presented on GAMS usage. In addition, the lab may review elements of the course like homework or tests plus respond to student questions. The lab assignments count as 10% of the final grade.

Midterm Exam:

One midterm will be given - at the end of Linear Programming (around week 8). The test will consist of two parts - one part in class and one part out of class due at 5 pm the next day. You are allowed to bring in one sheet of paper (letter size, double-sided) for use during the exam with contents of your choice. **The out-of-class part is individual, not a group effort**.

Final Exam:

The final exam will be in class and cumulative emphasizing the use of mathematical

programming. You are allowed to bring in two sheets of paper (letter size, double-sided) for use during the exam with contents of your choice.

Prerequisite:

Students will find it helpful to have elementary linear programming training including the simplex method and duality. Matrix Algebra knowledge is essential.

Course Description

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

Students for Whom the Course is Intended

The course is intended for Masters's and Ph.D. level students. Those entering the course should have a previous background in matrix algebra and would find linear programming training at the AGEC 622 level helpful.

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 the 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, 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 https://agecoresearch.tamu.edu/mccarl/regbook/ or a hard copy that people can get from copy corner.

Outline AGEC 641: Lecture Session

I. Introduction to Mathematical Programming – Chapters 1 and 2
II. Linear Programming Matrix Solution, Interpretation, Duality, and Sensitivity - Chapter 3 and 4
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

AGEC 641 – GAMS Lab

Lab Time: second half of Tuesday/Thursday's class or as needs
Instructor: Yifan Yang
Office: AGLS 363
Email: yyf027463@tamu.edu

Office Hours: Wednesday, 1:00 pm–3:00 pm CT or by appointment

Purpose: Introduce using GAMS to solve math programming problems like the ones you see in the lectures.

Grading: The lab grade will be based on 6 exercises, weighted equally. Exercises will be due one week after they are assigned. Turn in a printed and/or electronic copy. Email is fine. Please organize your programs well and use descriptive variable and equation names for full credit. In the past, questions on GAMS materials covered in the lab have appeared on midterm and final exams.

Content: The lab is primarily focused on how to use GAMS and how to read GAMS output. As time allows, examples of models presented in the lecture will be discussed. There will be ten to twelve labs. Lab notes and exercises will be emailed to you in advance. Notes are based on the GAMS programming class developed by Dr. McCarl. For a more expansive coverage of the material, you can attend the Basic+Advanced GAMS class he teaches during the summer.

Outline: The material covered in the lab will follow the outline below. Some of these topics can be covered very quickly, so on some occasions, two sets of notes will be done in one class period. If time allows, we will cover a special topic of your choice. Some possibilities are listed here.

1. Introduction to GAMS and GAMS-IDE
2. Formulation of a general problem
3. Model inspection & error messages
4. Power of GAMS & GAMS user guide
5. Good Modeling Practices
6. Examining a Model for Flaws
7. GAMSCHK: pre/post solution analysis
8. Report Writing

9. Conducting Comparative Analysis: Multiple Submissions and Loops
10. Conditionals
11. Output Improvement and Management
12. Special Topic (below are some options for this lab)
    a. Agricultural Impact Analysis
    b. Speeding up the Model
    c. Fixing Misbehaving Models
    d. Links to other programs
    e. Multiple Location Modeling
    f. CGE Modeling
    g. Non-linear programming
    h. Risk Modeling
    i. Integer Modeling

A few words from Texas A&M

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments. Please refer to Student Rule 7 in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reasons deemed appropriate by the instructor. Please refer to Student Rule 7 in its entirety for information about makeup work, including definitions, and related documentation and timelines.
Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" (Student Rule 7, Section 7.4.1).
"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (Student Rule 7, Section 7.4.2).
Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See Student Rule 24.)

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do." "Texas AM University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case"
(Section 20.1.2.3, Student Rule 20).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy

Texas A& M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality

Texas A& M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see University Rule 08.01.01.M1):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with Counseling and Psychological Services (CAPS).
Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's Title IX webpage.

Statement on Mental Health and Wellness

Texas AM University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to

engage in healthy self- care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Copyright Statement

Please note that all handouts and supplements used in this course are copyrighted. This includes all materials generated for this class, including but not limited to syllabi, exams, in-class materials, review sheets, and lecture outlines. Materials may be downloaded or photocopied for personal use only, and may not be given or sold to other individuals.