AGEC 739
Analytical Methods for Applied Economics
(Application of research techniques and methods to problems in agriculture, transportation and Risk)

Spring Semester 2012

Time and Place: 12:30 PM - 01:50 PM MW BARRY 260

Instructor: Dr. Saleem Shaik, 504 Barry Hall, Phone: 231-7459
E-mail: Saleem.Shaik@ndsu.edu

Method of Instruction: Classroom sessions are used for lectures, discussions, some problem solving, and estimation— I reward student participation. Students are expected to prepare for each class by reading the assigned materials.

Prerequisites: Math 146, STATS 331, AGEC 741 (Micro economics)

Course Description: This course takes an interdisciplinary approach to the study of mathematical techniques and its application to agriculture, transportation and resource management. This course has two modules. The first module emphasizes on the 1) review of basic probability; review of basic notation for mathematical techniques/optimization; constrained and unconstrained optimization 2) Modeling of mathematical techniques; duality; transportation model; network models and inventory models. The second module emphasize on the application of mathematical techniques to efficiency and productivity measurement. Estimate the ranking of firm, industry or sector using technical and economic efficiency measures followed by evaluating the causes of ranking. Incorporation of production, price, financial and institutional risk in efficiency/Productivity analyses using Monte Carlo simulations. Finally, the ability to use GAMS or SAS in applied research analyses related to mathematical techniques. After completing the course, students should be able to evaluate the suitability of research techniques and methods for use in applied research.

Course Objectives: Upon completion of the course, the student should be able to: 1) Understand the fundamentals of mathematical techniques, 2) evaluate the suitability of mathematical techniques learnt in the class for use in applied research, 3) describe and evaluate various mathematical
techniques used to estimate efficiency and productivity of farms/firms, 4) Move towards application of the mathematical techniques to include risk.

**Grading System**

Plan to follow a 10-point letter grade scale (Lower bound of 90% = A, 80% = B, 70% = C). But, reserve the right to alter the scale in favor of the students. The following list contains the different components of the grade for the course and the weight applied to each component.

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<tr>
<th>Component of grade</th>
<th>Weight applied</th>
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<tr>
<td>Class participation</td>
<td>10 %</td>
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<tr>
<td>Assignments</td>
<td>25 %</td>
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<tr>
<td>Research Project &amp; Presentation</td>
<td>25 %</td>
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<tr>
<td>Mid-term exam</td>
<td>25 %</td>
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<td>Final exam</td>
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**Office Hours**

Open door policy and feel free to contact me via email to arrange for an appointment.

**Class Attendance**

Attendance is expected. If you have to miss a class, you may want to obtain any important information from one or more of your classmates. I will not provide any make-up quizzes or exams unless you have an excused absence. If possible, please tell me about potential attendance problems before they occur.

**Homework**

Homework assignments and class projects will be assigned on a regular basis throughout the semester. You are to perform the assignments by yourself unless the assignment is identified as a group project. Please see me during office hours if you need help. You are to turn in homework at the beginning of the specified class. Late homework will not be accepted. Some writing assignments will require that you use a word processing program and print on a letter quality printer.
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<tr>
<th><strong>UNIVERSITY POLICY</strong></th>
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<td><strong>Honor Code</strong></td>
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| **Quizzes**           | Unannounced quizzes will be given, usually when you least expect them. |
| **Exams**             | Two exams will be given. The final exam will be given during the week of .......... from .......... in Barry Hall. |
| **Bonus**             | Submission of selected papers to WAEA or AAEA annual meetings |
Module 1

I. Review of concepts for mathematical techniques (1 class)
   – Hamdy Taha(HT); and Chiang and Wainwright(CW)

II. Review of Mathematical concepts for Linear Programming (1 week)
   A. Weierstrass Theorem
   B. Langrangian Methods
   C. Kuhn-Tucker conditions
   D. First and second order conditions
      – Chiang(C); Chiang and Wainwright(CW) and Hamdy Taha(HT)

III. Mathematical modeling (8-10 weeks)
   A. Modeling with linear programming
   B. Duality and post-optimal analysis
   C. Transportation model
   D. Network models
   E. Inventory models
      – Hamdy Taha(HT)

IV. Use of mathematical programming in efficiency and productivity measurement (5-6 weeks)
   A. Concepts of Efficiency and Productivity
      1. Time-series, cross-section and panel model estimation
   B. Accounting from Risk into Efficiency and Productivity measures
      2. Monte Carlo simulations

V. Other models the student would like to be covered (if time permits)
**Recommended Text**
*Operations Research: An Introduction* by Hamdy A. Taha

*Production Frontiers*, Rolf Fare, Shawna Grosskopf, C.A. Knox Lovell

**Useful Text**
*Fundamental Methods of Mathematical Economics*, Alpha C. Chiang

*Fundamental Methods of Mathematical Economics*, Alpha C. Chiang and Kevin Wainwright

*An Introduction to Efficiency and Productivity Analysis*, Tim Coelli, D.S. Prasada Rao, and George E. Battese.
Project Presentations

Or

Research Paper and Presentation Guidelines

The research paper should contain:

1. A problem statement giving a description; objectives; and hypotheses of the topic and making clear the nature and importance of the study.

2. A section on previous literature, in particular the approaches and results of previous studies on your topic.

3. A section on the method of analysis, including model definitions, assumptions and specification; the choice of model should be clearly defined.

4. A section documenting data development and citing sources.

5. A results section emphasizing major findings and providing details of results in tables and/or figures; contrast your findings to previous work.

6. A conclusions section focusing on implications and offering suggestions for future studies.

7. A bibliography including complete references for all citations; follow AJAE style.
OBJECTIVES OF THE CLASS

1. Understand the fundamentals of mathematical techniques,

2. Evaluate the suitability of mathematical techniques learnt in the class for use in applied research,

3. Describe and evaluate various mathematical techniques used to estimate efficiency and productivity of farms/firms,

4. Move towards application of the mathematical techniques to include risk.
   a. Monte Carlo simulation to evaluate the robustness of the model to include risk.