This course provides an introduction to computational economics for graduate students. It will cover the application of computational methods to economic models in fields such as sectoral economics, environmental economics, macroeconomics, financial economics, growth theory and others. The computational methods will include both simulation and optimization approaches as well as databases. A variety of computer languages will be used including MATLAB, GAMS and Mathematica.

Previous knowledge in economics, mathematics and computational methods is useful though strength in one or two of these areas can more than accommodate for little or no background in one or two of the others.

There are weekly computer exercises as well as two short papers, one due at mid-term and the other due near the end of the term.

The textbook for this course is


The web site associated with the book is

http://www.laits.utexas.edu/compeco/

This site has pointers to input files for most of the models that we will be using in the course, to the software packages, etc.
Also, there are two packets of materials for this course at Central Duplicating in GSB 3.136. The first is a collection of articles and the second is some chapters from the *User's Guide* for the Duali software.

You should buy the first packet. The second packet is optional. There is a version of it available on the Web and you can find it by going to

http://www.utexas.edu/cola/files/405607

Also you may want to access the first seven chapters from my *Stochastic Control for Economic Models (2nd Ed)* book. They are available on my web site for reading online or downloading at

http://www.utexas.edu/cola/depts/economics/faculty/dak2

Also some of the materials for the course can be found at the web site for the course which is

http://www.laits.utexas.edu/compeco/Courses/index392.html

Due to health problems Yumin will be delayed slightly in returning to Austin at the start of the spring semester. However, the web site above will serve well until he has time to return and update it. The dates will be off a little but the order of topics we will cover this year is the same as last year.

### Optional Texts

See DK about gaining access to these.


   
   http://www.gams.com
Outline

I. First Pass

Growth
   1. Chakravarty in Excel
   2. Chakravarty in GAMS

Transportation and Industrial Modeling
   1. Transportation Model in GAMS
   2. Small Mexican Steel

Databases
   1. U.S. Data in Access

Financial Modeling
   1. Portfolio Model in MATLAB

Agent Based
   1. Agent-Based Models in MATLAB

Game Theory
   1. Genetic Algorithms and Evolutionary Games in MATLAB

II. Second Pass

Financial Modeling
   1. Genetic Algorithms and Portfolio Models in MATLAB

Dynamic Optimization
   1. Dynamic Optimization in MATLAB

Personal Financial Planning
   1. Thrift Model in GAMS

Macroeconomics
   1. Hall and Taylor in GAMS
   2. Taylor Multicountry Model in GAMS

Environmental
   1. Global Warming in GAMS

Partial Equilibrium Models
   1. Partial Equilibrium in Mathematica
Computable General Equilibrium
   1. CGE Models in GAMS

Control Theory
   1. Deterministic Control in Duali
   2. Stochastic Control in Duali

Neural Nets
   1. Neural Nets in Excel

Big Data
   1. Using Python is Scrape Data from the Web
Reading List

I. First Pass

Growth
1. Chakravarty in Excel
   KMA Ch. 1 “Growth Model in Excel”
2. Chakravarty in GAMS
   Notes in Packet #1

Transportation and Industrial Investment
1. Transportation Model in GAMS
   KMA Ch. 4 “Transportation in GAMS”
2. Small Mexican Steel

Databases in Access
1. U.S. Data
   KMA Ch. 5 "Databases in Access"

Financial Modeling
1. Portfolio Model in MATLAB
   KMA Ch. 7 “Portfolio Model in MATLAB”

Agent Based
1. Agent-Based Models in MATLAB

Game Theory
1. Genetic Algorithms and Evolutionary Games in MATLAB
   KMA Ch. 11 “Genetic Algorithms and Evolutionary Games in MATLAB”
II. Second Pass

Financial Modeling
   1. Genetic Algorithms and Portfolio Models in MATLAB
      KMA Ch. 12 “Genetic Algorithms and Portfolio Models in MATLAB”
      KMA Ch. 14 “Agent-based Models in MATLAB”

Dynamic Optimization
   1. Dynamic Optimization in MATLAB
      KMA Ch. 16 “Dynamic Optimization in MATLAB”

Personal Financial Planning
   1. Thrift Model in GAMS
      KMA Ch. 6 “Thrift in GAMS”

Macroeconomics
   1. Hall and Taylor in GAMS
   2. Taylor Multicountry Model in GAMS
      Mercado and Kendrick (1997), "TAYGAMS: John Taylor's
      Two-Country Model in GAMS" - in Packet #1

Environmental
   1. Global Warming in GAMS
      KMA Ch. 15 “Global Warming in GAMS”
      Anantha Duraiappah (1993), Global Warming and Economic
      Development, Kluwer Academic Publishers, Dordrecht,
      The Netherlands.

Partial Equilibrium Models
   1. Partial Equilibrium – Ch. 3 in KMA

Computable General Equilibrium
   1. CGE Models in GAMS
      KMA Ch. 8 “General Equilibrium Models in GAMS”
      use Orani and also Seung Rae Kim’s model

Control Theory
   1. Deterministic Control in Duali
      Use this software to learn some Windows programming.
      Amman, Hans M. and David A. Kendrick, "The
      Duali/Dualpc Software for Optimal Control
      in Economics, TP 92-03, revised Dec. 1999 - in Packet #2
      Ch. 4 model from Kendrick (2002), Stochastic
      Control for Economic Models, 2nd Ed., available
at http://www.eco.utexas.edu/faculty/Kendrick
Also in Packet #3.

2. Stochastic Control in Duali
   KMA Ch. 17 “Stochastic Control in Duali” Sections 3 thru 6
   OLF from Ch. 6 of Stochastic Control book
   MacRae model from Ch. 7 of Stochastic Control book
   CE vs OLF – paper by Amman & Kendrick in packet
   or find it at the Computational Economics journal
   web site beginning from the Springer web site at
   http://www.springerlink.com
   Mitigation of the Lucas critique – paper by Amman and
   Kendrick in the packet or find it at the Elsevier web
   site for the JEDC journal beginning from
   http://www.sciencedirect.com

Neural Nets
   1. Neural Nets in Excel
      KMA Ch. 2 "Neural Nets in Excel"
### Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>Jan 15</td>
<td>Lecture</td>
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<tr>
<td></td>
<td>KMA Ch. 1 “Growth Model in Excel”</td>
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<td></td>
<td>Chakravarty model in GAMS – notes in packet</td>
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<td></td>
<td>Mercado, Lin and Kendrick – multi-sectoral growth model</td>
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<td>KMA Ch. 4 “Transportation in GAMS”</td>
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<td>Small static Mexican steel model.</td>
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<td>Jan 22</td>
<td>Lab Preparation</td>
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<tr>
<td></td>
<td>Chakravarty growth model in Excel</td>
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<td>Chakravarty growth model in GAMS</td>
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<td></td>
<td>Multi-sectoral growth model in GAMS</td>
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<td></td>
<td>Transport model in GAMS</td>
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<td>Small Mexican steel model in GAMS</td>
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<td></td>
<td>Lab</td>
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<td></td>
<td>modify and solve either (1) the Chakravarty growth model in Excel or GAMS, (2) the multi-sectoral growth model in GAMS or (3) the transport model or the small static Mexican steel model in GAMS</td>
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<tr>
<td>Jan 27</td>
<td>Lecture</td>
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<td>KMA Ch. 5 &quot;Databases in Access&quot;</td>
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<td>KMA Ch. 7 “Portfolio Model in MATLAB”</td>
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<td>Also we will use as an alternative the portfolio model in GAMS in App. 7C.</td>
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<td>Lab</td>
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<td>Database in Access</td>
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<td>Portfolio model in MATLAB and in GAMS</td>
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<td>Due</td>
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<td>Exercise on (1) the Chakravarty growth model in Excel or GAMS, (2) the multi-sectoral growth model, (3) the transport model or (4) the small static Mexican steel model.</td>
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<tr>
<td>Feb 3</td>
<td>Lecture</td>
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<td>Agent-based Models</td>
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<td>KMA Ch. 14 “Agent-based Models in MATLAB”</td>
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<td>Lab</td>
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<td>Agent-based Model in MATLAB</td>
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<td>Due</td>
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<td>Exercise on database systems or portfolio model.</td>
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<tr>
<td>Date</td>
<td>Day</td>
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<td>Feb 10</td>
<td>Lecture</td>
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<td>Lab Preparation</td>
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<td>Lab</td>
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<td>Due</td>
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<td>Feb 17</td>
<td>Lecture</td>
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<td>Lab</td>
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<td>Feb 24</td>
<td>Lecture</td>
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<td>Due</td>
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<td>Mar  3</td>
<td>Lecture</td>
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<td>Lab</td>
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<td></td>
<td>Due</td>
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<tr>
<td>Mar 10</td>
<td>Spring Break</td>
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</tbody>
</table>
Mar 17  Lecture
CGE Models –
   KMA Ch. 3 – Partial Equilibrium
   KMA Ch. 8 “General Equilibrium Models in GAMS”
Lab
   Partial Equilibrium Models in Mathematica
   General Equilibrium Model in GAMS
Due
   Exercise on the thrift model or on
   the Hall and Taylor Model in GAMS
   or the Global Warming Model

Mar 24  Lecture
Deterministic Control in Duali
   KMA Ch. 17 “Stochastic Control in Duali” Sections 1 and 2
Lab
   Abel in Duali
   Hall and Taylor in Duali
Due
   Nothing

Mar 31  Lecture
Stochastic Control in Duali
   OLF from Ch. 6 of Stochastic Control book
   MacRae model from Ch. 7 of Stochastic Control book
   Duali User’s Guide, Ch. 5 “Open Loop Feedback without Updating”
   KMA Ch. 17 “Stochastic Control in Duali” Sections 3 thru 6
Lab
   MacRae in Duali or Taylor in Duali
Due
   Exercise on the partial equilibrium or the general equil models.
   Abel or Hall and Taylor in Duali

Apr 7  Lecture
Tom Roderick on retrieving big data from the Internet
Lab
   Using Python code to automatically download pdf files from
   the Internet
Due
   Exercise on MacRae or Hall and Taylor or other stochastic control model
   with parameter uncertainty in Duali.
Apr 14  Lecture
  KMA Ch. 2 "Neural Nets in Excel"
Lab
  Neural net example in Excel (turn in during lab)
Due
  Exercise on downloading pdf files from the Internet

Apr 21  Lecture
  John Taylor’s multicountry models
  Intro to John Taylor’s Rational Expectations Model
  KMA Ch. 18 “Rational Expectations Macro in Duali”
  Sections 1 and 2
  Taylor Model in GAMS
Due
  Short Paper B

Apr 28  Lecture
  Quarterly Fiscal Policy
  Counterfactual Paper
  Monte Carlo Results Paper
Standing on the Shoulders

In addition to the GAMS Library there are model files available for a number of other studies. These are available from David Kendrick. These files include

- CHUNG: Korean Macroeconomics
- DURA: Global Warming
- HATHEWAY: U.S. Japan Macro Policy Coordination
- LETSON: Water Pollution Control
- LOFGREN: Egyptian Agriculture
- PARASUK: U.S. Macro and Control Theory

Also, there are more than thirty example models available in the Duali software. These models and the GAMS models offer a good starting point for the development of your own model.

Since there are a considerable number of weekly exercises (experiments), you can claim a “skip” on one of them during the semester by turning in that week a sheet with only your name the experiment name and the word “skip” on it. If you do not use the skip then the last exercise will be entered as skipped on the grade spreadsheet.

The University has a relatively new policy which permits the assignment of plus and minus grades in graduate classes. I plan to make use of that option this spring.

Grades

1. Short Paper A 35
2. Exercises 30
3. Short Paper B 35
   Total 100

I will make myself available to discuss appropriate academic accommodations that you may require as a student with a disability. Also students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, http://www.utexas.edu/diversity/ddce/ssd/

See the UT Honor Code at: http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.