The College of William and Mary
Economics 400: Computable General Equilibrium

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1. **Course Overview**: Before a proposal becomes official, policy makers often want to know how it would affect various parts of the economy. For example, what winners and losers would a carbon tax produce? How would nonfarm workers be affected by a tariff on wheat or another agricultural commodity?

   To answer those questions, economists often turn to Computable General Equilibrium, or CGE, modeling. This class of economic models assesses how the entire economy, including industries and households, is affected by policy changes in areas such as taxation, migration and trade policy.

   Not surprisingly, CGE modeling has influenced many debates in international development, such as trade policy, migration, climate change, carbon trading, food prices and pro-poor economic growth policies.

   A Computable General Equilibrium **(CGE)** model is one of the most rigorous, cutting-edge quantitative methods to evaluate the impact of economic and policy shocks -particularly policy reforms- in the economy as a whole. Because of its nature, this tool is significantly useful for policy design.

   CGE modeling reproduces -in the most possible realistic manner- the structure of the whole economy and therefore the nature of all existing economic transactions among diverse economic agents (productive sectors, households, and the government, among others).

   Thus, because of its nature, CGE analysis performs well when evaluating, among others:

   1) Fiscal policy
   2) Trade policy
   3) Environmental and energy policy

   This course has two overarching objectives:

   1) Provide you with a tool for optimization and policy evaluation;
   2) Provide you with an understanding of how economic models can be implemented numerically and how different individual characteristics will affect behavioral responses and policy effects.

2. **Course Materials**

   (a) **Textbook**: No textbook is required for the course. Readings and lecture notes will be available on blackboard.

   (b) **Software**: We will use the software **AMPL**: **A M**athematical **P**rogramming **L**anguage.

   A free student license is available for the duration of the course.

   The term *mathematical programming* has come to be used to describe the minimization or maximization of an objective function of many variables, subject to constraints on the variables. AMPL offers an environment for setting up and solving mathematical programming problems. By using a high-level representation that represents optimization models in the same ways that people think about them, AMPL promotes rapid development and reliable results.

3. **Assignments and Grading**

   (a) **Grading**:

Table 1: Components of the Course Grade

Weekly Memos	60%
Final Paper	30%
Presentation	10%

   (b) **Assignments**: Bi-weekly memos that will involve a one page write up for a simple model, analysis or component of the model development.

      1) Introduction to AMPL and mathematical programming
      2) Optimization in Economics
      3) Model Data and Calibration
      4) A Computable General Equilibrium Model
      5) The Social Accounting Matrix
      6) Policy evaluation

   (c) **Research Project**: The courses capstone paper will provide you an opportunity to use your quantitative skills in an applied area of your choosing.

      i. Research Paper: 10-15 page paper.
      ii. Presentation: 5-10 minute presentation.

4. **Other important notes**

   (a) **Daily class operations** You will develop professional habits of mind and get the most out of class by doing these things.

   The night before class:

   - Do the readings. Even skimming the relevant pages for 15 minutes will be worth it. Do not expect to understand the material after only one read. Re-reading certain pages in a new context will help to deepen your understanding of prior concepts while establishing new ones.
   - Check Blackboard for files to download for class. Download handouts, notes and model files and save to your computer.
   - Charge your laptop battery. Unfortunately, outlet power is not always conveniently located in our classroom, so dont rely on plugging in your machine during class.

   At the beginning of each class before lecture begins:

   - Arrive on time and quietly take your seat if you are late.
   - Have Stata running on your laptop computer or be sitting next to someone who does.
   - Close your email and Internet entertainment and disable all other electronic distractions.

   During class:

   - Ask questions when you do not understand something.
   - Do not attend to email, the Internet, or other electronic distractions, including phones.

   (b) **Appropriate use of computers in class** As section 4 (a) suggests, your laptops will be powerful educational tools for this class. However, do not let them or other electronic devices distract you, your fellow classmates, or me from our in-class work. Students who use electronic devices in class inappropriately suggest that they possess neither the intellectual focus nor the respect for others needed to do real professional work. Those students end up developing reputations that make it difficult for faculty members to give them strong recommendations to other professors and future employers.

Course Objectives: This course is intended to equip you with the conceptual, algebraic and computational tools used in applied general equilibrium analayses of economic, fiscal and trade policy issues.

1. Introduction to AMPL and mathematical programming
2. Optimization in Economics: Microeconomic Foundations
   (a) Consumer Behavior
   (b) Producer Behavior
   (c) Responses to Changes in the Economic Environment
3. Model Data, Calibration and Macroeconomic Closures
   (a) The Social Accounting Matrix
4. A Simple General Equilibrium Model
5. General Equilibrium: Taxation and Fiscal Policy
   (a) Tax reform
   (b) Environmental taxes
6. General Equilibrium: Trade Policy
   (a) Armington trade model
   (b) Multi-region models