BOSTON COLLEGE
Department of Economics

EC 313: Computational Economics — Spring 2000
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Course home page: http://fmwww.bc.edu/ec-c/s2000/313/

Required text: Gaylord et al., *An Introduction to Programming with Mathematica*, 2nd ed., 1996
Also required: access to a copy of MATHEMATICA version 4 for Macintosh, Windows or Linux (available in SLSC, O'Neill Library)

Objectives: This course provides an introduction and selective overview of the field of computational economics. Computational tools and techniques are increasingly being used to address complex issues in economic analysis. You will become familiar with use of the Internet for information retrieval and dissemination, and will use appropriate modeling and visualization tools to address topics in applied micro- and macroeconomics and produce and "publish" findings from a computational research project. No previous computing experience is required. You should have completed EC201 (or EC203) and EC202 (or EC204).

Requirements:
Problem sets, total 20%
Midterm exam, 20%
Research project, 30%
Final exam, 30%

Notes :
Problem sets will not be accepted after their due dates.
Work on problem sets should be your own.
It is your responsibility to be familiar with the College's policy on academic integrity and intellectual honesty, especially as it applies to the preparation of research papers.
The course will not meet on Tuesday, 8 February 2000.

Research Project

The research project will involve creation of two items: a set of web pages on your www2.bc.edu webspace describing the economic or financial question, model or technique being considered, and a MATHEMATICA notebook that implements the model or computational technique. The web pages are to contain a detailed description of the issue, with relevant hyperlinks to external sites containing additional information, documents, data, and the like. The MATHEMATICA notebook should make use of the package's formatting capabilities (e.g. expressing mathematics in mathematical notation in a description of the model or technique) and should contain 2-D and/or 3-D graphics where appropriate to illustrate the model's results or the technique's workings. You are urged to discuss potential topics for the research project with me well in advance of the due date, which will be the date of the final exam. The notebooks are to be fully documented, with appropriate citations to the literature, following the standard practices for attribution of others' work, and suitable for "publication" in a RePEc series on the World Wide Web.

Topics to be covered (references to G: Gaylord)
The URLs below are available on the course home page.

1. Access to Economic Information

A. Economics Information Resources, `http://fmwww.bc.edu/ec/info.html`
B. Resources for Economists on the Internet, `http://rfe.wustl.edu/`
C. RePEc and IDEAS, `http://ideas.uqam.ca/`
D. Statistical databases
  i. Economics Data Resources, `http://fmwww.bc.edu/ec/data.html`
  ii. Econ and Financial Data at BC,
    `http://fmwww.bc.edu/ec-p/data/ecfindata.html`
  iii. Experimental interface to RDBMS, `http://eclinux.bc.edu`

2. Programming Languages

"Programming languages in economics," D.A. Kendrick and Hans Amman
`http://fmwww.bc.edu/ec-c/s2000/313/proglan.pdf`
A. Low-level vs. high-level languages (FORTRAN, C, perl, MATHEMATICA)
B. Matrix languages (MATLAB, GAUSS, Ox)
C. Database languages (SQL)
D. Web-linked languages (PHP3, JavaScript)

3. MATHEMATICA as a general-purpose tool for computational economics

A. Overview (G § 1,2, Maeder `ProgrammingTutorial.nb`)
B. List manipulation (G § 3)
  i. Application: random walk
C. Functions (G § 4)
  i. Application: binomial, logit, probit
  ii. Application: Cobb-Douglas
  iii. Application: Solow growth model
  iv. Application: Black-Scholes option pricing (Miller `optvalue`)
D. Expressions, pattern matching, conditional functions (G § 5,6)
  i. Application: discontinuous behavior, hysteresis
  ii. Application: Tobit
E. Recursion (G § 7)
  i. Application: simultaneous linear systems
  ii. Application: real options to invest
  iii. Application: dynamic programming
F. Iteration (G § 8)
  i. Application: Gauss-Seidel
  ii. discrete-time dynamic models
G. Graphics (G § 10)
  i. Application: Brownian motion
  ii. Application: Term structure of interest rates
H. Applications (G § 11)
  i. Application: neural networks
  ii. Application: agent-based models
I. Contexts and Packages (G § 12)
  i. Application: `econometrics.m`
  ii. Application: dynamic Keynesian model