Basic GAMS Modeling
An Introductory Class
On line, June 5-June 8, 2023

This is an on line offering of a Basic GAMS class followed immediately by an advanced class. This will be a four day Basic GAMS class designed for those interested in applying GAMS modeling to the study of management decisions in the business and policy arenas. It will provide exposure to modeling examining the impact of changing prices, risk conditions and investment opportunities as they influence firms, the environment and the sector. Students are not expected to know GAMS ahead of time The whole class will deal with the topics of how to formulate GAMS based models starting from no assumed knowledge but working up through advanced formulation (dealing with price responsive demand, investments and risk as well as GAMS model debugging and improved output presentation topics. The outline is here.

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Next course:

- Online June 5 (8 am US central) – June 8 (1pm US central) (4 mornings -- Monday - Thursday)

For more information select any one of the following topics:

- Instructor
- What Will You Learn By Taking the Course?
- Brief Course Description
- Assumed Background and Motivation of Participants
- Class Objectives j
- Detailed Course Outline
- Course Presentation Method
- Materials and Experiences You Will Get by Attending the Workshop
- Things to Do Before the Class
- Course History and past Participants
- Course Site and Time Schedule
- Course Fees
- Need More Information?

Why on line

I am offering my GAMS classes as an online offering. This is due to three reasons. First, I gave this course via ZOOM the last two years and it opened it up the material to more students plus saved them travel money and time. Also the course feedback has indicated that it was effective in that format. Third, there are the ongoing COVID issues around the world and there is the likelihood that they will still be obstacles yet this year. I will be using ZOOM to deliver the class and distributing materials so that all overheads and class examples that are used in the zoom presentation are also available to each of the students in the form of a PDF or GMS files. I will also record the ZOOM sessions that I give and will make them available through the cloud for I believe as long as 30 days after the class is over.

Schedule

To accommodate the online presentation and people's varying time zones including a number in Europe I have shortened the class day and extended the number of days on which there will be classes by one day. In particular the

- **Basic class will go June 5- 8 from 8 AM until about 1 PM US Central (Chicago) time.**

- Advanced class will go June 7 - 9 and June 12 again from 8 AM until about 1 PM US Central (Chicago) time.
- Combined class will go from June 5 - 9 and then on June 12.

I also will make available and optional discussion time both scheduled and negotiated before and after class to accommodate people in different time zones.

Introduction to the Instructor

Bruce A. McCarl is a University Distinguished Professor and a Regents Professor at Texas A&M University in College Station Texas specializing in Mathematical Programming applications in Agricultural Economics. He has wide teaching, research, consulting and applied analysis experience in the application of mathematical programming and GAMS to industry, and government. (Read about some projects he has done). He wrote the Expanded Users Guide distributed with GAMS or at https://www.gams.com/mccarlGuide/gams_user_guide_2005.htm .

He has been on the Texas A&M faculty since 1985 and previously taught at Oregon State University, Purdue University and Pennsylvania State University. Dr. McCarl is a winner of awards from USDA, and USEPA for his optimization applications. He was part of the IPCC group that was awarded the Nobel Peace Prize. He is Associate Editor of Climatic Change. He was Editor of Choices and Associate Editor of Water Resources Research and the American Journal of Agricultural Economics. He is a Deputy Editor of Climatic Change. Dr. McCarl earned a B.A. in Business Statistics from the University of Colorado and a Ph.D. in Management Science from the Pennsylvania State University.

Dr. McCarl taught his first GAMS short course in 1986 and has been a GAMS user since 1985. He has written the GAMSCHK modeling assistance product and the Expanded User Guide plus a tutorial on STUDIO which is being freely distributed with releases of GAMS or through their webpage. He has consulted on optimization and GAMS use with employees of First National Bank of Maryland, Tasmanian Hydropower, Neodyme, USCOE, American Express, USAID, Government of Egypt, International Harvester, World Bank, Department of Energy, Bonneville Power, Electric Power Research Institute, USDA, and USEPA among others.

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What will the course help you learn?

You will learn techniques for doing firm impact modeling analysis including treatment of risk and investment modeling using the professional's choice in modeling software -- GAMS. The 4-day course will provide you with learning experiences regarding questions such as:

- Do you find it desirable to do a model on how the firm might act given changes in prices, programs, policies, regulations or environmental forces? Learn how to

model business and agricultural entities and reflect the influence of such forces on production processes and markets.
- Do you find yourself needing to model transportation and wish to incorporate it? Learn techniques for modeling transportation problems.
- Do you want to put a CGE model into MCP format but are unsure how to do it? Learn basic CGE modeling and MCP specification.
- When modeling does it take you a long time to construct, verify, use the model for comparative studies and convert output into meaningful reports? Learn techniques which increase the efficiency with which you use GAMS.
- Do you find yourself wanting to deploy your model and have heard of GAMS MIRO and wish to incorporate it? Learn how to use it.
- Have you heard about STUDIO, and GAMSCHK and wonder how they work? Learn about them from the developer of GAMSCHK who has used and taught GAMS since early 1998.
- Do you wish to pass data back and forth to a spreadsheet? Learn the techniques and see an easy pass technique developed by the instructor.

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Brief Course Description

Topics covered

- A Fundamental Introduction To GAMS
- Looking at a GAMS Generated Model to Make Sure it Appears Right
- Accessing GAMS Documentation
- Exploiting the Power of Integrated Algebraic Modeling
- Modeling a Firm's Decision Making Setting
- Basics of Using Conditionals and Post Solution Report Writing
- Good Modeling Practices
- Finding Out Why and Fixing Models That Do Not Work Right
- Incorporating Multiple Locations and Transportation
- Forming and Solving NLPs In GAMS
- Doing A Comparative Analysis
- Basic Introduction to CGE Modeling
- Intermixed treatment on GAMS usage including
    - Using GAMS STUDIO
    - Using GAMS Conditionals and Tuples to Control Algebra
    - Doing A Comparative Analysis
    - Output Improvement and Management
    - Links to Spreadsheets for Obtaining Data and Reporting Results
    - Using GAMS MIRO for Model Deployment

- Pre-Solution Checking of Models

See a more detailed outline

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Assumed Background and Motivation of Participants

The course will be instructed assuming those present wish to do impact analyses using GAMS but are not very familiar with the GAMS language. Participants should wish to receive practical instruction on topics that will enable them to easily do impact analyses and increase the efficiency and accuracy with which they use GAMS in modeling settings.

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Course Objectives

- To teach workshop participants techniques allowing them to
  - Learn to use GAMS
  - Conduct impact analyses
  - Use GAMS efficiently.
  - Better diagnose causes of improperly solving models
  - Enhance computer and human efficiency when using GAMS particularly when dealing with large models
  - Enhance the usefulness of GAMS output.
  - Use somewhat hidden and or new GAMS features.
  - Teach users how to use GAMSCHK, and STUDIO
  - Learn about MIRO as a deployment possibility
- To carry out this instruction in an applied environment exposing students to a variety of modeling issues and techniques

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Course Presentation Method

The class will mix hands on computing sessions with on line computer based lectures. Participants will be provided with zip files with all class examples and back up documents. Participants will also receive a personalized PDF of all overheads. During the pre and post class optional discussion sessions and during hands on sessions the instructor will interact on demand regarding class topics, questions and general GAMS usage.

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By taking this course you will

- Receive training on the topics above
- A Personalized pdf of all overheads that will be used in the class.
- A Zip file that contains all class examples, and reference documents
- At least 30 day access to ZOOM recordings (this is the duration for which ZOOM stores materials)
- ZOOM based discussions during class presentations and questions as they arise in the hands on exercises.
- Optional beginning and end of day question/discussion sessions
- Treatment of topics as listed in the schedule that is available on the GAMS web page under courses
- Ability to request as many as two personalized zoom sessions with the instructor of duration one half hour. These will be arranged at a mutually agreeable time during the time interval between June 10 and June 30.
- Be virtually exposed to others attending the class learning about their impact analysis usage
- Interact with the instructor who is a very experienced impact analysis modeler.
- Be trained in the use of software

GAMSCHK	analyzes GAMS models and assists in their use
GAMS-STUDIO	PC, MAC and Linux editing, execution and debugging environment
Put_toHTML and Put_toEXCEL	Simplified Links to HTML and EXCEL
MIRO	A package for creating graphical and tabular output displays of solution results that can also be based on a server

- Receive manuals on GAMS usage, and class notes including

  A Guide to Algebraic Modeling Using GAMS by McCarl and Spreen -- a book on agricultural modeling using GAMS

  McCarl's GAMSCHK writeup

  McCarl's Expanded GAMS User Guide

  The latest GAMS release

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Things to Do Before the Class

The class will be conducted using PCs, Students will have available an Editor which resides in the GAMS-STUDIO integrated development environment. Students wishing to use other editors or their own laptops should feel free to bring such. Note course software will be distributed through the internet and a zipfile.

Students wishing to do reading before the class can download (using the Adobe pdf Reader)

the GAMSCHK writeup

- Advanced GAMS usage tips
- A paper using GAMSCHK
- Notes on use of the STUDIO
- The course setup and schedule
- The course notes when I send them out
- A copy of McCarl and Spreen

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Course History and past Participants

This course has been taught previously since 1998 once or twice a year. In addition courses with much of the material herein has been taught by Dr. McCarl at Texas A&M, Oregon State and Purdue for over 25 years. Prior participants in this training who have used concepts in their jobs include individuals employed in the insurance, banking, agricultural, telecommunications, government and energy arenas.

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Need More Information?

Additional course and related material is available in the web pages linked to this one giving the

- Detailed Course Outline
- List of instructor projects
- GAMSCHK description
- The course setup and schedule
- See a sample of basic course notes
- See a sample of more advanced course notes

Related material is on

- McCarl's home page

- the GAMS home page

Other questions may be addressed by email to
brucemccarl@gmail.com or courses@gams.com
or to

Bruce McCarl
2100 Fawn Court
College Station, TX, 77845
979-204-6023

Daily Schedule:

Check-in on the first day: 8:00 - 8:15 a.m. US central
Morning classes: 8:00 a.m. - 1:00 pm

See schedule here

Who Is the Instructor

The course will be taught by Bruce McCarl.

- He is a very experienced GAMS user and instructor having taught
  - His first GAMS course at the World Bank in 1982
  - Commercial courses before diverse audiences since 1985,
  - An optimization course with associated GAMS lab since 1987
- He has been a GAMS user since 1982 and continues today developing several new models within the last year.
- He wrote the so-called McCarl guide which served as the official GAMS documentation from the year 2000 until about 2018 and then much of the content of that guide was migrated into the most recent GAMS documentation. Furthermore the McCarl guide is still distributed with GAMS.
- He has also written a number of GAMS based utilities including
  - GAMSCHK which allows one to diagnose misbehaving models and
  - procedure to obtain advanced basis,
  - procedures to graph solution output and
  - procedures to move solution information to HTML and spreadsheets.
- His main application areas include agricultural, environmental, water and energy modeling although he is also done work in finance, chemical engineering, forestry and greenhouse gas control.

- He has taught commercial classes since 1985 most of which have been general across a number of different application areas but with specialized courses directed toward agricultural applications, electricity sector applications, petroleum refining, military applications.

Course introduction and detailed schedule

Fee, Payment, and Registration

The course fee depends on payment date and computer requirement. The following fee schedule applies:

Fee normal participant - if payment received 14 or more days prior to start of class: $1600
Fee – university student**, if payment received 14 days prior to start of class: $1000
Fee - if paid later than 14 days prior to start of class: $1750
Fee - university student**, if paid later than 14 days prior to start of class: $1150

One may take this class jointly with the Advanced Class for an additional $700 for non students and $400 for students.**

**** Generally a student is one who is full time at the university being paid at a student rate or being unfunded. It is not someone finishing up a degree while working at a company or university earning non student wages.**

An **eligible lap top** must
- o run the systems required by the latest GAMS which is now Windows 10 or better or MAC High Sierra or better,
- o be able to read a memory stick or download a zip file and
- o have more than 30 megabytes of available disk space

The fee includes an evaluation version of GAMS, a complete set of course notes (see sample course notes), and a zip file containing all class examples, programs and backup documents. Checks, Visa, MasterCard, American Express, and purchase orders are accepted.

How to Register for Course

To register by phone, fax, or e-mail, contact:
Course Coordinator
GAMS Development Corp
tel: 202-342-0180
fax: 202-342-0181
email: courses@gams.com

To register by mail, send name, address, phone, fax, and email address (with payment or purchase order) to:

Course Coordinator
GAMS Development Corp.
2751 Prosperity Avenue
Suite 210
Fairfax, VA 22031