

**On line Basic to Advanced GAMS Modeling**  
**July 27 – July 31, Aug 3 , 2020**

This is an offering of a six day on line bridged Basic to Advanced GAMS class. This will be a GAMS class designed for users initially who know little about GAMS or in need of a refresher who wish to improve their skills in terms of GAMS model setup, usage and debugging. It will cover many topics- see the [outline](#) for details.

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## Next course:

- On line – July 27 (8 am ) – July 31 (1pm), 2020 (6 days – Monday 27 – Friday 31 and Monday Aug 2)

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](#)
- [Detailed Course Outline](#)
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- [Need More Information?](#)

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## Why on line

I am moving my summer GAMS classes to an online offering. This is due to the ongoing COVID issues and the likelihood that they will still be major obstacles as of late July. I will be using ZOOM to deliver the class and distributing materials so that all overheads and glass 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 July 27, 28, 29 and 30 from 8 AM until till about 1 PM US Mountain (Denver) time.
- Advanced class will go July 29, 30, 31 and August 3 again from 8 AM until about 1 PM US Mountain (Denver) time.
- Combined class will go from July 27 - 31 and then on August 3.

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

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. 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](#) which is being freely distributed with releases of GAMS. 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 both basic and advanced techniques for better using the professional's choice in modeling software -- GAMS. The 5-day course will provide you with learning experiences regarding the following questions:

- 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 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.

- Have you ever had a model which was infeasible, unbounded or worse yet optimal but nonsensical? Learn approaches that reveal where problems are in models so you can fix them.
- Does it take you a long time to construct, verify, use for comparative studies and convert output into meaningful reports? Learn techniques which increase the efficiency with which you use GAMS.
- Do you have a GAMS implementation that takes a long time to compute, generate or solve? Learn ways to find out the cause of extensive solution time and ways that have, in cases, reduced execution times by an order of magnitude or more.
- Have you ever talked to an experienced modeler and found out there are powerful things GAMS can do that you don't know about because of hidden features or a lack of treatment in the documentation? Learn a number of such features.
- Have you heard about GAMSIDE, GAMSCHK and wonder how they work? Learn about them from the developer of GAMSCHK who has used and taught the GAMS since early 1998.
- Do you find yourself modeling large problems? Learn techniques to facilitate your and others understanding, documentation, ease of use and level of comfort with such models.
- Do you want to link GAMS to a spreadsheet either just using and returning data or doing a more interactive approach? Or do you even want to run GAMS in the background in a manner transparent to the user? Learn techniques to allow this.
- Might you want to deploy your model on the web? Learn about MIRO

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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
  - Small to Large Model Development
  - Doing Calculations and Using Macros
  - Conditional Compilation
  - Post Solution Debugging of Models that Obtain Nonsensical Solutions
  - Scaling Models Within GAMS
  - Finding and Fixing Execution Errors
  - Fixing Unbounded and Infeasible Models
  - Finding and Fixing Causes of Slow Model Execution and/or Excessive Memory Use
  - Improving Efficiency by Saving Model Status and Restarting from Saved Status
  - Using Advanced Bases and Starting Points
  - Using and Exploiting GAMS Solvers

[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 initially are not very familiar with the GAMS language. It will then build to advanced topics. 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 on line 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 undocumented and or new GAMS features.
- Teach users how to use [GAMSCHK](#), [GAMSIDE](#) and the GAMS library builder
- To carry out this instruction in a practical GAMS application setting exposing students to a variety of modeling issues and techniques

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## What is the class focus

Unlike most of the other classes offered through the GAMS Webpage based list of courses, these classes do not focus on computable general equilibrium applications but rather on general GAMS applications with more of a focus in the optimization arena. Optimization examples will be the main ones used. Additionally there will be a short introduction to CGE. Furthermore a number of topics will be treated which are modeling method independent.

## 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
- 30 day access to ZOOM recordings (this is the duration for which ZOOM stores materials)
- ZOOM base 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 July 27 and August 4.
- 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 and receive copies for your use of

[GAMSCHK](#) analyzes GAMS models and assists in their use  
GAMS-IDE PC editing, execution and debugging environment

- 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 GAMSIDE](#)
- [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 since 1995 at least 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, military, petroleum, chemical engineering, 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 [bruceccarl@gmail.com](mailto:bruceccarl@gmail.com) or [courses@gams.com](mailto:courses@gams.com)

or to

Bruce McCarl  
2100 Fawn Court  
College Station, TX, 77845  
979-693-5694(phone Sept-May 1)

Bruce McCarl  
352 Lake View Drive  
Po Box 24219 (for any usps mail)  
Silverthorne, Colorado 80498  
Mobile: (979) 204-6023 (May 1-Aug 31)

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## Daily Schedule:

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

## 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: \$1950

Fee - university student\*\*, if payment received 14 days prior to start of class: \$1350

Fee - if paid later than 14 days prior to start of class: \$2050

Fee - university student\*\*, if paid later than 14 days prior to start of class: \$1450

**\*\* 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](mailto: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

Lodging reservations must be made separately.

### **Course Site (not this time we are online)**

On Line for now but later Dillon is a town located in Summit County amidst the Rocky Mountains and bordering Lake Dillon. It is conveniently off of I-70 and only 80 Miles West of Denver at 9000 feet or 3000 meters. For more see

[http://www.discovercolorado.com/Summit\\_County\\_Colorado/](http://www.discovercolorado.com/Summit_County_Colorado/)

### **Location Dillon course:**

Best Western Ptarmigan Lodge (not this time as course is online)

652 Lake Dillon Drive

P.O. Box 218

Dillon, CO 80435  
I-70 Exit 205  
Tel: (970) 468-2341  
[stay@ptarmiganlodge.com](mailto:stay@ptarmiganlodge.com)  
[www.ptarmiganlodge.com](http://www.ptarmiganlodge.com)

### **Meals, Accommodations, and Travel**

(not this time as course is online) Refreshments will be available starting at 8:00 am and throughout the day, but other meals, accommodations, and travel are not included in the fee. Participants are responsible for making their own arrangements.

The Best Western Ptarmigan Lodge has a block of rooms at a cost of \$90 per night they are holding until May 11. When making reservations identify yourself as a participant in the GAMS Computer Modeling Course. You will need to call the hotel directly in order to receive the group rates at [970-468-2341](tel:970-468-2341) on or before May 11 or go to the web site [https://www.bestwestern.com/en\\_US/book/hotel-rooms.06098.html?iata=00171880&ssob=BLBWI0004G&cid=BLBWI0004G:google:gm b:06098](https://www.bestwestern.com/en_US/book/hotel-rooms.06098.html?iata=00171880&ssob=BLBWI0004G&cid=BLBWI0004G:google:gm b:06098) (which may give a higher rate) . Other hotels are available in the area including a Comfort Suites, A Hampton, a Super 8 and Dillon Inn nearby. The visitors bureau provides a web page (that you can find by searching Dillon Colorado Lodging ) with lodging details and visitor information. Larger places for groups may be rented through places like Wildernest <http://www.wildernest.com/> or 5 Diamonds Lodging <http://www.highcountrylodges.com/>.

To fly in go to the Denver Airport – **do not** go to Eagle Vail unless you are renting a car.

The hotel is served from the Denver Airport by several van companies  
[Colorado Mountain Express](http://www.coloradomountainexpress.com) 800-525-6363 or 970-926-9800 vans  
Peak 1 express <http://www.mountainshuttle.com/>  
Summit express <http://www.summitexpress.com/scheduled-shuttle-service/denver-airport-to-Frisco-co-shuttle/>  
[Greyhound](http://www.greyhound.com) and [Bustang](http://www.bustang.com) both have bus service from Denver to nearby Frisco (under \$15 one way in Nov 2019) but at limited times and a need to get to downtown Denver.

All take you to the area. Go to the Frisco Transfer station for cheapest rates (2 miles from Hotel)

Many services, restaurants, and a grocery store are within walking distance. Also local bus service is free. Driving from Denver airport takes 1.5 hours.