

30 December 2008

Course information for MA391 - Mathematical Modeling

What is the first class all about? Since this is a course in Mathematical Modeling I thought we would try our hand at collective modeling.

You will find material for the course posted at the course web site:

<http://www.dean.usma.edu/departments/math/courses/ma391/> .

This (along with email) is how I will communicate assignments and resources throughout the semester.

FIRST DAY OF CLASS Thursday, 8 January 2009:

Before coming to class and after the first class and before the second class I expect you to look at the Resources – basically Mathematica materials, much of which you should have seen, but we can all benefit from review. These are found on the course web page under “Resources” for the first day Lesson 1, 8 Jan 09. If you do not “know” these immediately be patient with yourself, for we shall use a good number of commands repeatedly and get very comfortable with Mathematica (and EXCEL as well) as a modeling tool and a system for doing mathematics.

I am asking Jordan Berry (Section Marcher Appointee) and Steven Dexter (Assistant Section Marcher Appointee) From Section A3 and I am asking Daniel Alvey (Section Marcher Appointee) and Bryan Brod (Assistant Section Marcher Appointee) from Section D2 to lead the class during the first day of class, Thursday, 8 January 2009. More on leading the class and what you can expect to accomplish together in the first day below. However, I will expect the Section Marcher to report attendance to me at Lesson 2.

I shall be attending the Joint Mathematical Meetings of the American Mathematical Society/ Mathematical Association of American in Washington DC. Indeed, Thursday morning I am on a pane to encourage young faculty to participate in the Scholarship of Teaching and Learning through writing up the activities they offer their students in class. I am doing this in conjunction with my editorship of the journal PRIMUS - Problems, Resources, and Issues in Mathematics Undergraduate Studies.

I will be back in town on Sunday evening, 11 Jan 09 and in class on Monday, 12 Jan 09 for Lesson 2.

See the journal’s web page at the following URL for more information on PRIMUS.

<http://www.informaworld.com/smpp/title~db=all~content=t776095548~tab=editorialboard> .

What is the first class all about? Since this is a course in Mathematical Modeling I thought it would be a good idea to develop a mathematical model using a situation, your previous mathematical knowledge, and technology (Mathematica).

Where do we locate the activity? On the course web page (see above) you will see a column entitled, “Problem Sets” and under the date 9 Jan 09 (Day 1 of class) you will see two files. . . . both Mathematica. PS #1 and TanksALot. These are the problems we shall be working on (both in and out of class) for the first few days and complete (I mean complete!) write-ups will be due for both on 20 Jan 2009.

Basically this course will consist of Problem Sets. We have no text. There will be no exams. There will be no TEE. We will have an individually designed project later in the course. I expect quality effort and results, great communication in your write-ups, exceptional documentation which reflects a healthy collaborative spirit, and timely submissions. I will spell this out in an Instructional Memorandum which I shall post on the web page.

In your write-ups of the Problem Sets you will be making the case for your grade in the course and you will be demonstrating to me and yourself your progress in applying the mathematics we study to model phenomena and address issues related to the modeling effort, e.g., we shall be working on estimating parameters in differential equation models in our first few lessons.

Leading and accomplishing on the first day of class.

What can we expect to accomplish in class? I suggest you begin with Problem Set #1 (PS #1). It along with the problem in the notebook TanksALot will be due in class on Tuesday, 20 Jan 2009. Late one day is 10% loss, late two days is 100% loss! Example of exponential loss. . . . you do now want to know what happens at the three day mark!!!!

[You will note that buried in this notebook there is a section entitled, "Mathematica Utilization in MA391." That, along with the above notebooks on Mathematica, you ought to do on your own, and, of course – always, we would be happy to answer questions on syntax in class or during AI.]

Get yourselves in groups of two or three – two might be better for this, go to the Problem Statement Under Exercises read (a) and try your hand at modeling the phenomena, being sure to identify all variables by name, kind, and units. If you read carefully you will see that this data is not needed for successful completion of (a); indeed, not even for (b). Now compare models at the board. Make sure all folks are up to speed, understand what the terms of the model do, and how the overall model works.

Now go on to Part (b) in which some numbers are offered for the parameters or constants of the problem. Solve the model for $x_1(t)$ and $x_2(t)$ and offer plots.

Do Part (c) in which we are asking you to verbally describe what is happening and what some Mathematica commands do. Remember, we are looking for "quality effort and results, great communication in your write-ups."

OK, you might, as a class get to Part (d) – if not finish that part by Monday. In (d) we are playing "what if" games with our model a very valuable skill to test the reasonableness of the model and to make use of the model as a predictive tool in any study. Often, "what if" IS **THE** reason for building the model itself.

Hold off actually doing Parts (e) and (f), but come to class with some ideas on what we could do to estimate our parameters if we are given the data. This is often a real motivation for building the model, e.g., pharmacokinetic models try to predict the absorption rates (the parameters k_{ij} in this case) of a drug in order to design a good dispensing regimen for doctors to prescribe, e.g., "take one every four hours not to exceed 6 in a 24 hour period." We shall work on (e) and (f) in class and get some ideas on how to get the technology to work for us.

Mathematica 7.0: We will be using Mathematica 7.0 – it has the same underlying features, but lots more bells and whistles, some of which we might want to use. You will notice that the Mathematica notebooks (some of them) I have put up for your examination on the course web page may give rise to the following message, “This notebook was created in a more recent version of Mathematica, and may not function properly with the older front end you are using. Contact Wolfram Research (www.wolfram.com) for upgrade information.” That is because you are probably running Mathematica 6.0 and I (and you soon) will be running Mathematica 7.0.

Before class on Monday (12 Jan 09), you should install Mma 7.0. **WARNING: DO NOT DELETE MMA 6.0.** You might want to delete any DeskTop icon for Mma 6.0 and when ready insert Mma 7.0 icon as a short cut. So here is the scoop on installing Mma 7.0.

First, you have to get the software and here is the information. You will probably be running Mma 7.0 in Windows – see the red cell in the table below. So put the

[file:///usmaedu/apollo/math/software/Mathematica7/Mathematica 7 for Windows](file:///usmaedu/apollo/math/software/Mathematica7/Mathematica%207%20for%20Windows)

into your web explorer and when you get there click or double click on setup.exe, whereupon Mma 7.0 will begin to install itself in a separate folder in Programs Files under Wolfram Research\Mathematica in a folder called 7.0.

To get a DeskTop Mma 7.0 icon with which to launch the software you can do this – go to Start-> Programs ->Wolfram Mathematica and create a short cut for Wolfram Mathematica 7 – NOT the kernel, but “Wolfram Mathematica 7.” OR you can go to C or D:\Program Files\Wolfram Research\Mathematica\7.0 and right click on Mathematica.exe to “Create a Shortcut” which you can then drag to the DeskTop.

PASSWORD FOR MATHEMATICA 7 and 6.0.3 (L3002-9103)

6.0.3 Windows - 52017-42369-40796-53088-00687-551 software @ file:///usmaedu/apollo/math/software/Mathematica6.0.3/windows	7.0 Windows - 41934-02579-36469-51824-08747-551 software @ file:///usmaedu/apollo/math/software/Mathematica7/Mathematica 7 for Windows
6.0.3 Macintosh - 29364-34764-09108-54057-57382-551 image @ file:///usmaedu/apollo/math/software/Mathematica6.0.3/mac	7.0 Macintosh - 21882-12072-50040-22784-53876-551 image @ file:///usmaedu/apollo/math/software/Mathematica7/Mathematica 7 for Mac OS X
6.0.3 UNIX (LINUX) - NO PASSWORD U MUST REGISTER ONLINE USING L3002-9103 software @ file:///usmaedu/apollo/math/software/Mathematica6.0.3/unix	7.0 UNIX (LINUX) - NO PASSWORD U MUST REGISTER ONLINE USING L3002-9103 software @ file:///usmaedu/apollo/math/software/Mathematica7/Mathematica 7 for Linux

The first time you try to execute a command or when prompted to enter the password you will have a prompting screen which asks for the following:

User:

Organization: US Military Academy

Password:

Leave the USER the same – blank if it is so, but **YOU MUST TYPE IN THE ORGANIZATION AS**

US Military Academy

This is very important else it will not work.

The PASSWORD is: enter what is above, e.g., in Windows use the following password which you can cut and paste into the appropriate window space: **41934-02579-36469-51824-08747-551** - copied from the Windows cell of the above table.

1. The next step will be registration. **ONLY PICK REGISTER LATER!**
2. The process is then complete.