GEO111 – NUMERICAL SKILLS IN GEOSCIENCE

week #01: Introduction to MATLAB

26th September 2016

Work plan

Work through Chapter #2 of the GEO111 course text (and continue during the Friday pm class).

There is a lot of stuff crammed in here and it would be easy to get lost in a mire of commands and instructions. So here is a brief guide to what you will ne doing/seeing as you go through Chapter #2:

1. **Section 2.1.** Firstly ... just get familiar with the software window(s) that appear. (HINT: make the MATLAB program window full screen so that you can see properly what is going on. PDF instructions etc. could be opened the monitor of a 2nd PC, or your laptop (or vice versa).)

2. **Section 2.2.** Some important basic stuff about what a variable is and the different types of variables. Also how you assign some information to a variable name (and read it back out again). There are some lists of expressions and operators ... some of these will be familiar, and some not. For now: simply note the existence of the non-familiar ones (we'll come back to them when we need them).

3. **Section 2.3.** Vectors ... there is a steeper learning curve here. It is important to understand quite what they are and how to select ('address') specific elements from them. Conceptually, this is the biggest step to take in all of MATLAB. The colon operator is key here.

4. **Section 2.4.** Some light relief and basic (line) plotting.

5. **Section 2.5.** Another big step and matrices (2D arrays). Again – how you select elements and entire rows of columns, is key understanding. Arrays (matrices and vectors etc), how they are represented and used in MATLAB is the most single difficult thing. It is all easier after this!

6. **Section 2.6.** Basic loading and saving of data from/to files. Useful, and not too difficult. There are many ways of doing this – here is data input/output in its most simple incarnation. We'll see other ways later on.

7. **Section 2.7.** A few useful MATLAB commands will be introduced here (and some more later on in the course) that greatly help in data processing and later on, in programming. These techniques (sorting data, scaling data) are buried in a couple of 'real world' data examples.

8. **Section 2.8.** A little more on plotting – how to make your graphs nice! Also buried in here is some more practice in basic vector and array usage.

For additional/background reading:

- **MATLAB®7 – Getting Started Guide**

    - Chapter 1 – *Introduction* (all)

    - Chapter 2 – *Matrices and Arrays* (excluding the sections on the *Magic Function* and *Linear Algebra*)

    The PDF version of this document can be found on the Mathworks website on the as well as on the course webpage. Note that some of the very introductory material in the course handout is derived from this.

- The published textbook – **MATLAB®7 – A Practical Introduction to Programming and Problem Solving [*Attaway*, 2013]**

    - Chapter 1 – *Introduction to Programming using MATLAB* (all)
    - Chapter 2 – *Vectors and Matrices* (all)

Learning goals (aka: 'what specifically should I have got to grips with?')

Topics and methodologies you should be familiar with:

- variables and variable types
- vectors and matrices
- addressing (elements in) vectors and matrices
- basic transformations of vectors and matrices
- basic loading and saving of data and graphics
- basic plotting

specific MATLAB commands you should be familiar with:

- the **colon operator**
- `load`
- the plotting functions: `plot`, `scatter`, `pcolor`, `hist`