

AE1106: Programming I

Graded Assignment #2

December 8, 2010

Please read these instructions first:

As an individual assignment, the code and solutions you submit should represent your own work. Discussion with others is not allowed, and neither is the use of online resources other than the standard Matlab help pages (i.e., no Wikipedia, Google searches, chat windows, etc.). During this assignment, the student assistants and the lecturer will only answer questions related to what the question is asking you to do, and will not assist you with how to actually complete the assignment. When finished, you will submit your Matlab source code file(s) to BlackBoard for grading (see below for submission instructions). The deadline to complete the assignment is 12:00 for morning sessions, and 17:00 for afternoon sessions. These deadlines are managed automatically by BlackBoard, so it is important that you submit your documents before the deadline in order to receive credit for the assignment (i.e., manage your time so that you start the submission process at least 15 minutes before the deadline). Those students who have been approved by the student counselors to receive extra time on their exams will receive an extra 30 minutes to complete the assignment.

Questions:

1. (3 points)

A text file **DU300.txt** is provided with the lift coefficient C_l (2nd column) and the drag coefficient C_d (3rd column) as function of angle of attack α (1st column; in degrees) of a typical wind turbine airfoil. Notice that the angles of attack α are given in increasing order.



Note: do not use the built-in functions *max* or *find*; also dot arithmetic is not allowed since this week's topic is loops.

Write a script file named **profile.m** which performs the following tasks:

- reads the text file
- determines the angle of attack α_0 for which the lift to drag ratio is maximal. Display this maximum lift to drag ratio as well as the angle of attack α_0 to the screen.

- determines the smallest angle of attack α_1 for which the lift coefficient is larger than 1.008 **and** the drag coefficient less than or equal to 0.204. Display this angle of attack α_1 to the screen. Use a **for-loop** (and no while-loop)
 - determines the largest angle of attack α_2 for which the lift to drag ratio is larger than or equal to 100 **or** the drag coefficient less than 0.108. Display this angle of attack α_2 to the screen. Use a **while-loop** (and no for-loop)
- Hint: you can use one of the following identities in order to arrive at a correct condition:

$$\sim(L1 \& L2) \equiv \sim L1 \mid \sim L2$$

$$\sim(L1 \mid L2) \equiv \sim L1 \& \sim L2$$

2. (4 points)

Write a function file named *ExpSeries.m* that computes the value of e^x at a given x using the series expansion of the exponential function (up to the term with x^n):

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots = \sum_{k=0}^n \frac{x^k}{k!}$$

Let x and n be the input to your function and y and err be the output. y is the series expansion and err is the percentage error in y when compared to (Matlab built-in routine) $\exp(x)$.

Take care of the following points:

- *ExpSeries.m* is a function file; so do not prompt a user for input (*input* command) and do not display (intermediate) results to screen
- Header (H1 line) and comments
- The function should accept a vector x . **Note: for this assignment you are NOT allowed to use dot arithmetic**
- Include a check on the input n . The function should proceed only if $n > 0$ is an integer
- A default value of $n=8$ should be taken if the user does not specify n
- If you did everything right you will see that the variable 'err' becomes smaller for larger n . Try it yourself

3. (1 point)

Write a short script file named *aero.m* which contains an example of a for-loop which is aerospace related (i.e. not about money or beer). Make sure (through variable names and comments) that your example can be understood by a fellow student and is recognizable as an aerospace topic.

4. (2 points)

Write a function file named *squares.m* with three inputs (integers *i1*, *i2* and *i3*) and two outputs (*x* and *y*). The function should perform two tasks (read it a couple of times in order to figure out what is exactly asked):

- the output *x* is a vector of exactly *i2* elements: the squares of integers starting from *i1* (inclusive)
- the output *y* is a scalar: the first square of an integer (starting from 0) that is larger than *i3*.

Do not forget the header (H1 line) and comments.

You have to upload 4 files in total:

- *profile.m*
- *ExpSeries.m*
- *aero.m*
- *squares.m*

Submission Instructions

1) *When you are ready to submit your files to BlackBoard, go to the Assignments and then click on the “Graded Assignment 2” item. This will open a page where you can upload your assignment files.*

2) *By clicking on the “Browse My Computer” button next to the “Attach File” label, you can add one or more files to your assignment submission. You can save the current state of your submission at any time using the “Save as Draft” but your work will not be officially recorded in the system until you click the “Submit” button. After you have submitted the assignment, BlackBoard should then show you a summary page, which lets you know the submission went successfully. Please be patient after submitting your files, as sometimes it takes a few seconds before BlackBoard registers everything properly. We recommend that after submission, you wait 15-20 seconds, then go back to the course homepage and proceed again through to the “Graded Assignments 2” item. After doing this, you should see all of your submitted files in the summary page if everything went smoothly.*

3) *Remember that the submission folder automatically disappears at the deadline, so please make sure you start the submission process well before this time.*

4) *If you made an error and you wish to change a file after you have hit the submit button, you can go back to the “Graded Assignment 2” link and click on the “Start New Submission” link to repeat the entire process (i.e., do not just submit the updated file, but completely resubmit all files). Note that if you make more than one submission, we will only grade the last attempt.*

5) *As a reminder, please do NOT include special characters in the names of your files, such as “%”, brackets “[]”, underscores “_”, etc., as BlackBoard may have problems with these. Also, do NOT upload a “.mat” or “.asv” file...only upload your “.m” files, or other documents (e.g., MSWord file) if requested.*