EGR 110 Due Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Engineering Graphics

File: EGR 110 MATLAB Assignment D

# **MATLAB Assignment D - Statistics and Data Files**

**Reading Assignment:**

EGR 110 MATLAB Lecture D - Statistics and Data Files

Section 3.6 (built-in functions) in MATLAB – An Introduction with Applications, 5th Edition, by Gilat (freely available through Safari books on the TCC library website)

**General instructions for all MATLAB assignments.**

* **Warning**: Your assignments must be your own work. You can ask other students questions, but sharing files is cheating. If any evidence of copied files is discovered, all parties involved will receive grades of 0 and may be subject to further disciplinary action.
* For **all problems**, begin all MATLAB programs (scripts or .m files) with the following information:

 % John Doe (**your name**)

 % EGR 110

 % Homework Assignment #?, Problem ?

 % Filename: YourFileName.m

 % Instructions: (briefly summarize the instructions for the problem)

* Use descriptive variable names
* Use ***format compact*** to reduce extra lines in the output.
* Use the disp( ) function to display your name and assignment number.
* Print the program (script or .m file) and the results for each problem. If you post the results online, post both the program and the results.

**MATLAB Assignment:**

1. (50 points) ***Cable car times***: Student teams competed in a cable car competition and recorded their times to race across a 50 m test cable. The following times were recorded (in seconds):

 8.50, 12.67, 13.50, 9.28, 10.05, 10.67, 10.05, 19.83, 15.44, 17.59, 9.77, 8.88,

 (add 24 more values distributed between 5.00 and 20.00)

1. Enter the values above into ***Notepad*** in a format so that they can be read into a single column vector or row vector. Save the text file using your last name and the problem number for the file name.
2. Write a MATLAB program to read the text file and use functions in MATLAB to find and display each of the following (including units). The program should work for a file with any number of values (not just for 36).
	* Average time
	* Median time
	* Mode
	* Standard deviation
	* Number of cable car runs recorded tested
	* Standard deviation
	* Maximum time
	* Minimum time
3. Display the original times (4 per line) with a descriptive heading
4. Sort the times from smallest to largest and display them again (4 per line) with a descriptive heading.
5. Submit a copy of the text file, a copy of the MATLAB program, and a copy of the MATLAB output. All MATLAB programs should begin with a block of comments including name, course, assignment number, problem number, and a brief description of the program. Also include comments throughout the program.
6. (50 points) ***Center of mass***: If the mass and the location of the ***center of mass***, C, (with respect to a common origin) for different parts of an object are known, the center of mass can be easily calculated using a ***weighted average***. Refer to the diagram on the following page for the definitions below:
* mi is the mass of part i
* Ci is the center of mass for part i
* xi is the x-coordinate of the center of mass for part i
* mT is the mass of the entire object
* CT is the center of mass for the entire object
* xT is the x-coordinate of the center of mass for the entire object.

**CT**

**x**

**xT**

**C1**

**C2**

**C3**

**x1**

**x2**

**x3**

**x**

**O**

**O**

 Center of mass for each part shown Center of mass for entire object shown

***Example:*** If the object illustrated above has the following values for xi and mi, find the total mass, mT, and the location of the center of mass, xT.

|  |  |  |
| --- | --- | --- |
| Part i | xi (mm) | mass (g) |
| 1 | 35 | 100 |
| 2 | 55 | 50 |
| 3 | 75 | 150 |



1. Enter the values below into ***Notepad*** using ***two columns*** so that they can be read into a matrix. Add 9 more sets of similar values (for a total of 12 sets). Save the text file using your last name and the problem number for the file name.

|  |  |
| --- | --- |
| xi (mm) | mass (g) |
| 35 | 100 |
| 55 | 50 |
| 75 | 150 |
|  |  |
|  |  |
|  |  |

(continued)

1. Write a MATLAB program to read the text file into a matrix and then create separate vectors for x and m from the matrix. The program should work for any number of sets of values (not just 12). The MATLAB program should also find and display each of the following (including units)
	* Total mass
	* The value of xT
2. Submit a copy of the text file, a copy of the MATLAB program, and a copy of the MATLAB output. All MATLAB programs should begin with a block of comments including name, course, assignment number, problem number, and a brief description of the program. Also include comments throughout the program.