In place of a signature, please include a commented statement in your code affirming your recognition of the Academic Honesty Policy for the Exam 1. You will replace the blank with your name and UHID as an acknowledgement in your starting file as acknowledgement of this policy.

```
% I,<INSERT FULL NAME> (<INSERT UHID>) acknowledge that the Exam 1 for ENGI 1331,
% is to be completed by myself with no collaboration with anyone.
% I have read the ENGI 1331 Position on Academic Honesty and agree
% to abide by its provisions while taking this exam.
% I acknowledge that my submission will be run through a similarity code.
% Any student with unacceptable levels of commonality with peers or
% other sources will be brought up for an academic honesty violation.')
```

INSTRUCTIONS:

This virtual computer exam will be given on Saturday, February 27, 2021.

(1) You must be logged in with video on to your virtual classroom during the entire exam. If you lose connection during the exam, re-enter the virtual classroom and proceed with the exam.

(2) Computer with internet access and video is required.

General Rules

- You should **suppress** all output to the Command Window except if specific formatted output is requested.
- You must use any variable names specified. **If a variable name is not specified, you may create your own name for the variable.**
- **Do Not Hard Code for a specific case – your code must be flexible based on the instructions provided.**

Exam Timeline and Submission:

You will **have 1 hour to complete all tasks after the 15-minute downloading/planning period and 5 minutes to upload your code**. After time is called, you will be expected to close out of MATLAB and zip your exam folder.

(3) During the exam, **NO COLLABORATION** of any kind (messaging of concepts, code or sharing of files) is permitted. If you are found to have collaborated during the exam, you will be brought up on academic honesty violations with the appropriate penalty enforced.

After the exam is completed and the files are submitted, any procedure (such as opening the file) which alters the date / time stamp of the file will void any allowances for mis-saved files – in other words, **after the exam is over DO NOT OPEN the file again!**

Saving Exam File

You will be expected to have one main script file associated with your exam submission in addition to any starting files, exported files, or function files. Save your script file in the exam folder on your desktop as **Exam1_cougarnet.m**. All other functions that are requested should be named as instructed with the correct function name. You must submit a .ZIP folder named **Exam1_cougarnet.zip** that contains your main script and all supporting files.

MATLAB Programming (75 points) – Approx. 60 minutes + 15 minutes for planning

Background

Background: *During the heat of a Houston Summer, many electrical power suppliers monitor the amount of energy consumption rate throughout the city in kilowatt-hours (kWh) to make sure the system is not overwhelmed. For highly populated areas, the data (**Exam1data.mat**) below shows the total energy consumption for 1-day (24 hours). The data is collected at irregular intervals with increased frequency during the hottest parts of the day (there are more data points during this time period).*

*All provided data is within **Exam1data.mat** and contains:*

1. ***Time**: vector of numerical values ranging from 0 to 23.5.*
2. ***Area**: string vector of names for locations in Houston*
3. ***Energy**: energy consumption rate (kWh)*

*NOTE: The number of rows in **Energy** is equal to the number of areas provided in **Area** and the number of columns in **Energy** is equal to the number of values given in **Hour**. See the tables below for a visual representation for a portion of the entire data.*

Time

Area	0	1	5	7.2	8	9	11	11.5	12.1	13	13.5
Galleria	56	49	39	43	45	34	42	41	21	56	40
Gulfton	58	29	13	47	19	32	29	39	18	59	46
Meyerland	35	22	21	43	28	32	51	20	21	32	21
Heights	34	30	28	32	41	25	37	25	32	15	15
Midtown	27	14	51	37	49	35	27	34	25	23	25
Downtown	11	9	10	25	14	36	57	21	57	30	26
Third Ward	28	58	12	47	57	51	54	53	31	40	31
Rice Village	15	58	18	19	49	50	38	19	19	23	35

Energy (kWh)

Program Goal: By completing the tasks described below, you will provide important energy consumption statistics for areas and times in Houston.

NOTE (avoid hardcoding): Your function and script should produce different results if the size of the data set or individual values change.

Tasks:

Task 1 (10 min) – 12 pts

Main Script (12 pts)

Load in **Exam1data.mat**.

- Prompt the user to enter a new area name and update the **Area** string vector with the new area name appended to the end.
- Prompt the user to enter a new vector of energy consumption values (length of vector equals number of columns in **Energy**) and update the **Energy** matrix with the new vector of energy consumption values on the last row.
  NOTE: the input used in the sample output is given as a comment in your starting script. Copy that into your input statement when testing your code.

Save the two updated variables (**Area** and **Energy**) to a .mat file named **UpdatedData.mat**.

Task 2 (30 min) – 46 pts

Function (12 pts)

Develop a function named **AreaStats_cougarnet** (replace cougarnet with your cougarnet username), which determines the minimum, median, average, and maximum value for a specific area (row). The function will have one input (the specific row within **Energy**) and one output (a row vector containing the statistics in the order listed).

Function Inputs:

1. Vector of energy consumption for 1 area (one row of **Energy)**

Function Outputs:

1. A row vector containing the minimum value in position 1, the median value in position 2, the average value in position 3, and the maximum value in position 4

The function header should be formatted similarly to the following:

```
function [out1] = AreaStats_cougarnet(in1)
```

Remember, you are free to use whatever variable names you want, but they must be listed in the same order as given in the input/output lists provided above.

Main Script (34 pts)

Using a menu, prompt the user to select an **Area**. Create a second menu (excluding the area previously selected) and prompt the user to select a second **Area**.

For each of the two selected **Area**s, use the function **AreaStats_cougarnet** to create a row vector containing the minimum value in position 1, the median value in position 2, the average value in position 3, and the maximum value in position 4.

Create a matrix with the results of the first area selected in row 1 and the second area selected in row 2. Export the matrix as a .csv file named **Task2Result.csv**. See the sample output example.

For the first selected area, create a plot with the time on the x-axis and the energy consumption on the y-axis. The plot formatting should include the following:

- x and y axis labels
- Grid lines
- Markers shown as individual symbols (not a line)
- Title as the selected **Area**

Task 3 (15 min) – 17 pts

Main Script (27 pts)

Use the updated data from Task 1 to determine the following and output each to the command window as shown in the sample output:

- the area with the highest average energy consumption and the associated value
- the time with the lowest total energy consumption and the associated value

Sample Output:

Sample output for given data:

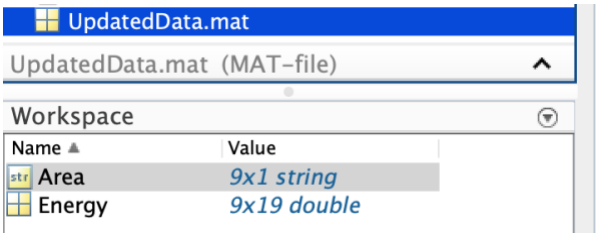
- Expected exported files are given below. Note the different file types of the exported files.

Sample Output to Command Window (Inputs from Task 1 and Formatted output from Task 3)

```
Command Window
  Enter a new area (string):  UH
  Enter a vector of new energy usage values:  [10,11,12,13,14,15,16,25,26,27,28,29,30,40,50,40,30,25,20]


  Third Ward Area has the highest average energy consumption at 39 [kWh]
  23.5 Hour has the lowest total energy consumption at 178 [kWh]
```

Sample Output for Task 1 (Exported File) – Only 6 of 19 columns shown



Area — 9x1 string

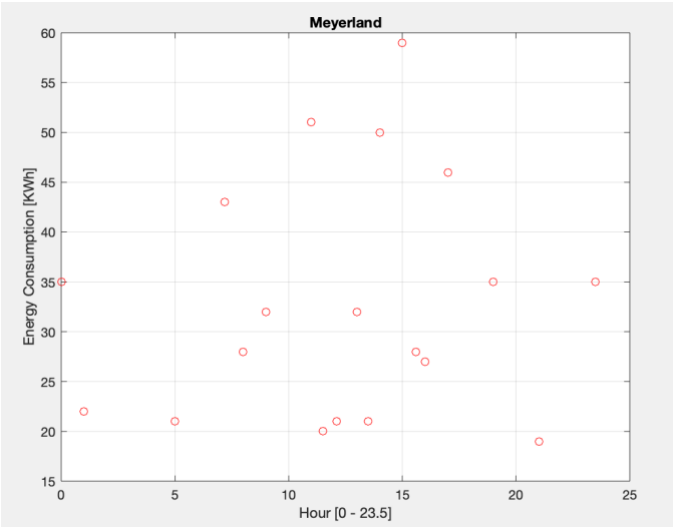
	1
1	Galleria
2	Gulfton
3	Meyerland
4	Heights
5	Midtown
6	Downtown
7	Third Ward
8	Rice Village
9	UH

Energy — 9x19 double

	1	2	3	4	5	6
1	56	49	39	43	45	34
2	58	29	13	47	19	32
3	35	22	21	43	28	32
4	34	30	28	32	41	25
5	27	14	51	37	49	35
6	11	9	10	25	14	36
7	28	58	12	47	57	51
8	15	58	18	19	49	50
9	10	11	12	13	14	15

Sample Output for Task 2 (Exported File and Plot)

Menu Selection 1: Meyerland and Menu Selection 2: Midtown



Task2Result.csv

	A	B	C	D
		Task2Result		
	VarName1	VarName2	VarName3	VarName4
	Number	Number	Number	Number
1	19	32	32.8947...	59
2	11	30	31.8421...	57