
ENGI 1331 – Exam 1

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 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 Wednesday, June 23, 2021.

- 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.
- 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

Programming in MATLAB (only portion): This exam should take you approximately 1 hour to complete and 15 minutes for planning and 5 minutes to upload your code. Total time is 1 hours and 20 minutes.

Finishing the exam

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

- During the exam, **NO COLLABORATION**, or you will be dismissed with a **ZERO**.

After the exam is completed and the file collected, 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 script file associated with your exam submission and any starting files or exported files. Save your script file in the exam folder on your desktop as **Exam1_cougarnet.m**. There should be no other scripts or functions besides the exam file should in the folder. You must submit a .ZIP file named **Exam1_cougarnet.zip** that contains the script necessary to run your code.

ENGI 1331 – Exam 1

Background: Residential Energy in the US is measured and sold in units of kilowatt-hour [kWh]. In Texas, a household's monthly electricity bill is based on their energy consumption and contracted rate from their chosen energy provider. Table 1 shows Dr. Luna's monthly energy usage since 2018. Usage for months in the future equal 0.

Table 1. Dr. Luna's Monthly Energy Usage in kWh

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2018	678	706	837	827	1378	1733	1968	1826	1509	1047	799	768
2019	643	628	659	985	1451	1626	2077	2412	1694	1032	701	722
2020	518	548	836	1053	1312	1625	1988	2117	1579	1164	863	624
2021	559	560	684	957	1458	0	0	0	0	0	0	0

EXAM1.mat file provided has three variables that contains the information in the table above:

- **MONTH:** contains the month name (string array)
- **YEAR:** contains the year (vector)
- **ENERGY:** contains the energy usage for the corresponding month and year in units of kilowatt-hour[kWh]

Perform the following tasks referring the sample output on the next page.

TASK 1 (12 pts)

- [2 pts] Load the data **EXAM1.mat** into your script.
- [2 pts] Create a menu to select a year from the **YEAR** variable.
- [2 pts] Create a menu to select a month from the **MONTH** variable.
- [6 pts] For the selected year and month, create a formatted output for the corresponding energy usage as shown in the sample output

TASK 2 (20 pts)

- [3 pts] Remove the last row from the variable **ENERGY** (this updated **ENERGY** variable will be used for the remainder of the exam).
- [3 pts] Determine the total energy used for each year using the updated **ENERGY** variable.
- [6 pts] Determine the years with the minimum and maximum energy usage.
- [4 pts] Export the range of yearly energy usage (minimum and maximum value) as a row vector named **Task2.csv** in the following order: (1) minimum and (2) maximum.
- [4 pts] Create a formatted output for the results above (see sample output).

TASK 3 (13 pts)

- [3 pts] Determine the overall average monthly energy usage from the updated **ENERGY** variable.
- [2 pts] Using the updated **ENERGY** variable, create a row vector of the average energy usage for each month. Store this row vector in a variable names **AVG_E**.
- [2 pts] Export the **AVG_E** variable as a .mat file named **Task3.mat**.
- [4 pts] Using the **AVG_E** variable to represent the energy usage in a year, determine how many months in a year have an energy usage greater than the overall average monthly energy usage.
- [2 pts] Create a formatted output for the results above (see sample output).

TASK 4 (20 pts)

Consumers in Texas can choose their energy provider and contract. You want to compare to 2 contracts to help Dr. Luna pick the most affordable contract.

- [2 pts] Contract 1 (Fixed Rate contract): Using the average energy usage for each month, **AVG_E**, from Task 3, calculate a row vector of estimated monthly energy costs for the fixed rate contract given by the equation below where C is the estimated monthly cost and E is the energy usage in kWh.

$$C = 0.054E + 0.033547E + 4.39$$

ENGI 1331 – Exam 1

- [12 pts] Contract 2 (Tiered Rate Contract): Using the average energy usage for each month, **AVG_E**, from Task 3, calculate a row vector of estimated monthly energy costs for the tiered rate contract given by the equation below where C is the estimated monthly cost and E is the energy usage in kWh.

$$C = \begin{cases} 75 & 0 < E < 1001 \\ 150 & 1001 \leq E \leq 2000 \\ 150 + 0.0115E & E > 2000 \end{cases}$$

- [2 pts] Determine the total estimated yearly cost of each plan.
- [2 pts] Export the total estimated yearly cost for each plan as a column vector named **Task4.xlsx** in the following order: (1) Contract 1 and (2) Contract 2.
- [2 pts] Create a formatted output for the results above (see sample output).

Sample Output

Command Window

Energy usage in April 2019 was 985 [kWh].

The least amount of energy was used in 2018 with 14076 [kWh].
The most amount of energy was used in 2019 with 14630 [kWh].

The average energy usage per month is 1192.6 [kWh]. 5 months per year use greater than the average usage.

Contract 1 will cost an estimated \$1305.57 per year.
Contract 2 will cost an estimated \$1397.49 per year.

Task 1: Select 2019

MENU

Select a year:

2018

2019

2020

2021

Task 1: Select April

MENU

Select a month:

January

February

March

April

May

June

July

August

September

October

November

December

Task2.csv (Task 2):

Task2.csv	
A	B
Task2	
VarName1	VarName2
Number	Number
1	14076
2	14630

Task4.xlsx (Task 4):

Task4.xlsx	
A	
Task4	
VarName1	
Number	
1	1.3056e+03
2	1.3975e+03

AVG_E (Task 3):

Variables - AVG_E												
AVG_E												
1x12 double												
	1	2	3	4	5	6	7	8	9	10	11	12
1	613	627.3333	777.3333	955	1.3803e+03	1.6613e+03	2011	2.1183e+03	1594	1081	787.6667	704.6667