

# 2PEM-100A

## PRACTICE 5\_1

### Energy Consumption Modeling

More information:

- <https://2pem100a.blogspot.com/>

More examples:

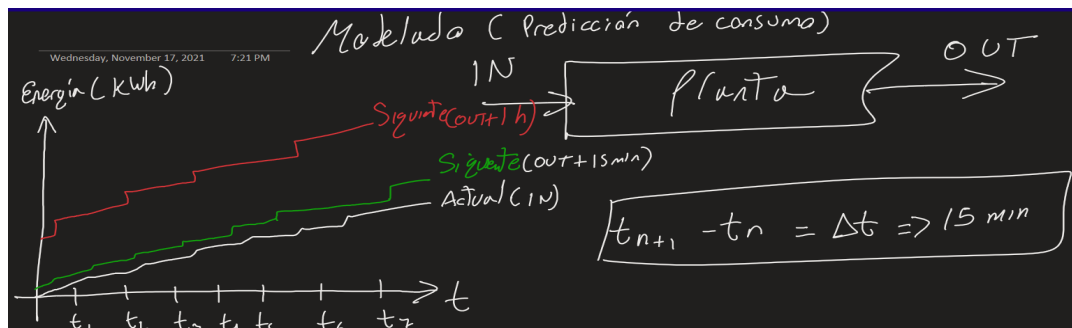
- [https://github.com/vasanza/Matlab\\_Code/tree/Electrical-Systems-Simulation](https://github.com/vasanza/Matlab_Code/tree/Electrical-Systems-Simulation)
- [https://github.com/avbazurt/Simulacion\\_Sistemas\\_Electricos](https://github.com/avbazurt/Simulacion_Sistemas_Electricos)

Dataset:

- <http://ieee-dataport.org/8630>

Technical information

- Sampling frequency: 4Hz (250mSeg)

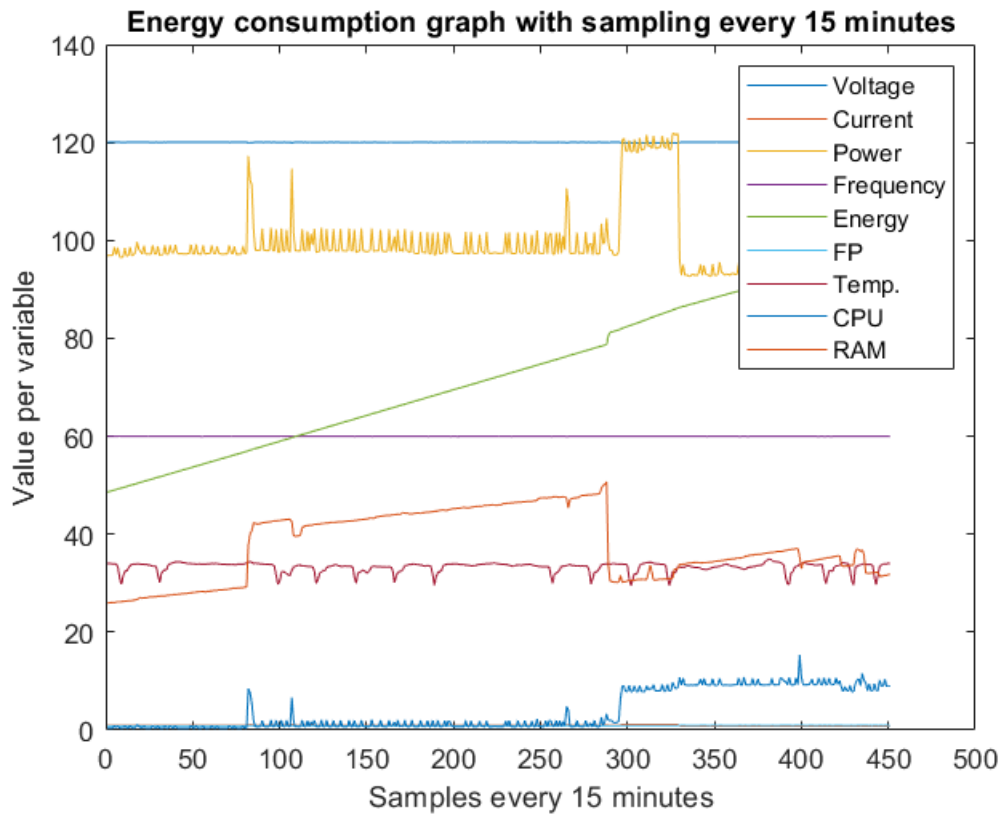


1- Loading a .mat file with 1sample sampling rate / 15min = 1sample / 900seg

Data (451x9), donde 451x15min=6765min/60min=112.75horas/24=4.69dias

```
clear;%borra el workspace
clc;%borra el comand windiw
path=fullfile(' ./datamean.mat');
data=load(path);
data=struct2cell(data);
data=data{1,1};%table
plot(data);%datos originales
title('Energy consumption graph with sampling every 15 minutes');
legend('Voltage', 'Current', 'Power', 'Frequency', 'Energy', 'FP', 'Temp.', 'CPU', 'RAM');

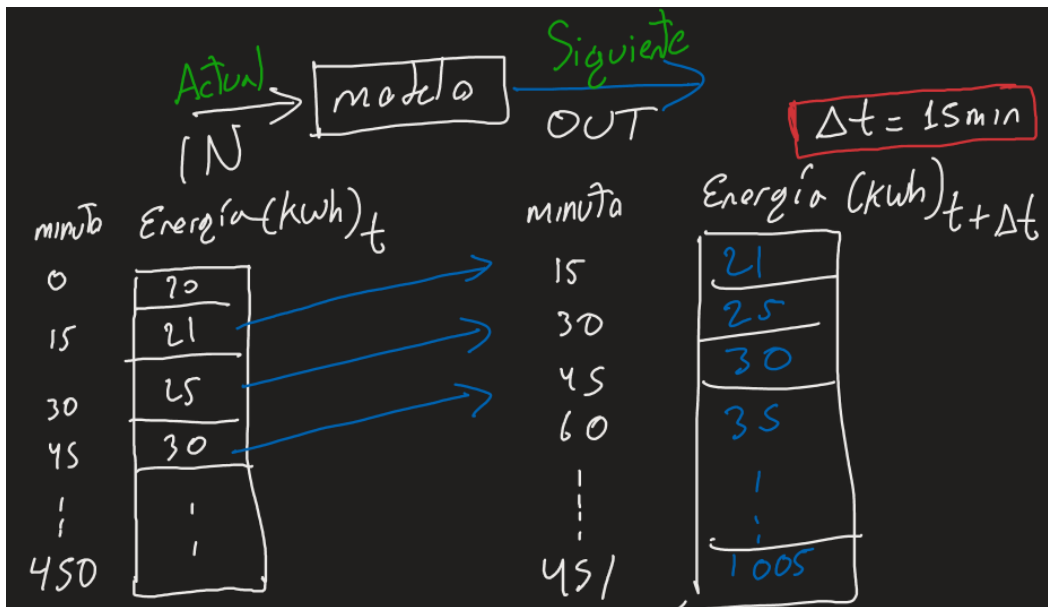
xlabel('Samples every 15 minutes');
ylabel('Value per variable');
```



## 2- Separate variables

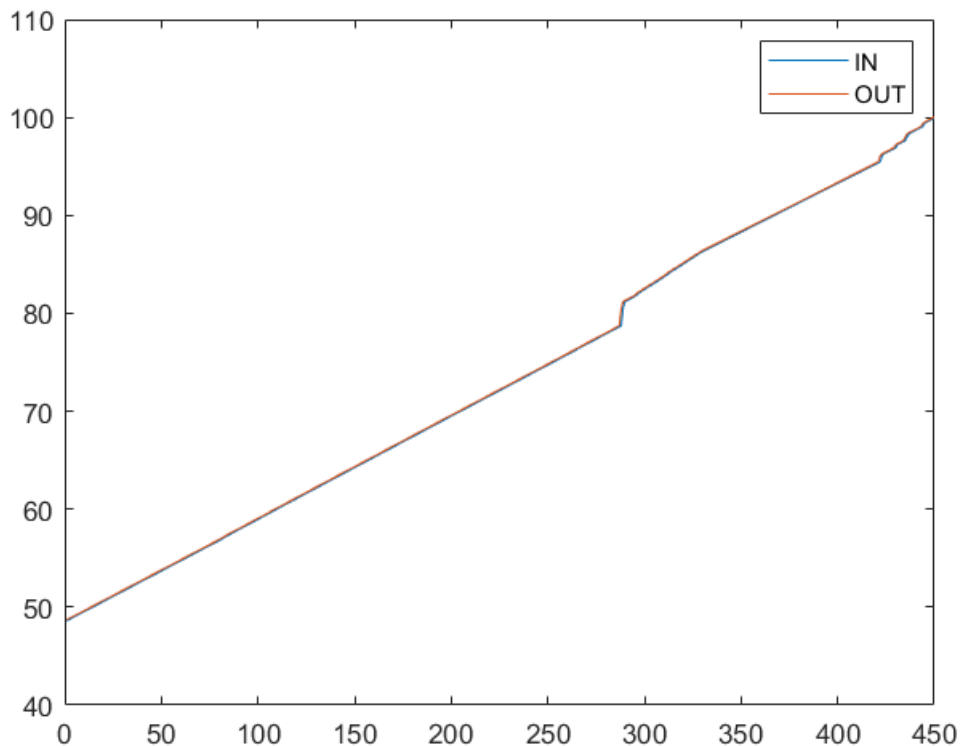
```
Time=(0:1:length(data)-1)'; %Time Vector
Voltage=[Time data(:,1)];
Corriente=[Time data(:,2)];
Potencia=[Time data(:,3)];
Frecuencia=[Time data(:,4)];
Energia=[Time data(:,5)];
FP=[Time data(:,6)];
Temp=[Time data(:,7)];
CPU=[Time data(:,8)];
RAM=[Time data(:,9)];
```

**Example 1: Generate the input (IN) and output (OUT) data of the model**



```
% Fila 1 -> Tiempo, Fila 2 -> Variable
IN=Energia(1:length(Energia)-1,2);%Energía actual (t)
OUT=Energia(2:length(Energia),2);%Energía siguiente (f+dT)
Datos=[IN OUT];

plot(IN);
hold on
plot(OUT);
legend('IN','OUT');
```

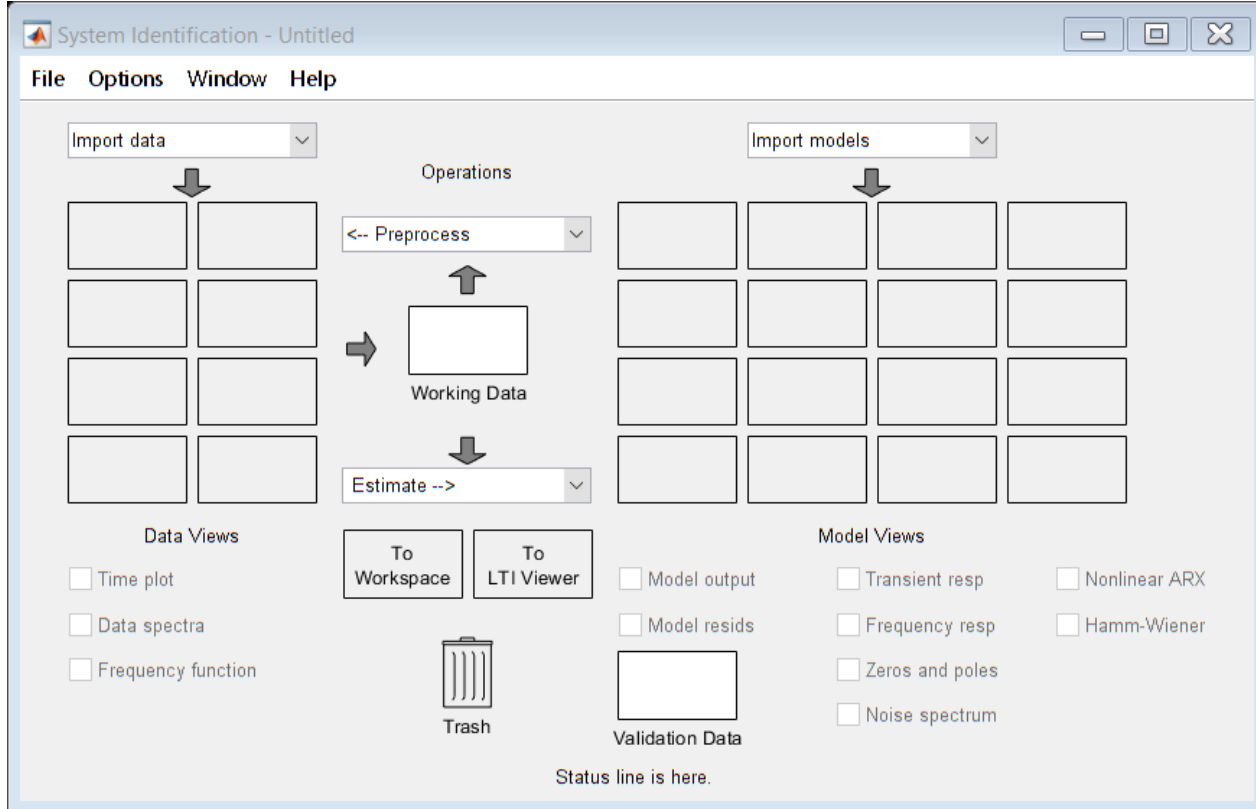


```
save('Datos.csv','Datos');%Guarda los datos en formato CSV
```

## Ejemplo 2: Identificación System Toolbo

ident

Warning: The "ident" command is obsolete and may be removed in a future release of MATLAB. Use the "systemIdentification" command instead.



## Ejemplo 3: Energy consumption modeling

```
% Transfer Function obtained (Method 3)
G=tf(d2c(arxqs));%<---Best FIT Model Modelo con mejor FIT
num=cell2mat(G.numerator)
```

```
num = 1x5
    1.2970    0.0060    0.0000    0.0000    0.0000
```

```
den=cell2mat(G.denominator)
```

```
den = 1x5
    1.0000    0.0039    0.0000    0.0000    0.0000
```

```
FTmotor=tf(num,den)
```

```
FTmotor =
```

```
1.297 s^4 + 0.006039 s^3 + 1.509e-05 s^2 + 2.036e-08 s + 1.404e-11
-----
s^4 + 0.00394 s^3 + 1.052e-05 s^2 + 1.604e-08 s + 1.403e-11
```

Continuous-time transfer function.

```
Time=(0:1:length(IN)-1)'; %Vector de tiempo
y = lsim(G,IN,Time); % system response
figure
plot(y);
hold on;
plot(IN);
plot(OUT);
legend('Estimated Next Value', 'Actual', 'Actual Next Value');
```

