Comments in Computer Codes

Our philosophy in this course is that comments in computer codes should be sufficient so that a peer/colleague could easily understand what is going on in the code without having to look at the Handout. This is consistent with best-practices in industry/research, where engineers will most likely be collaborating in a team to develop computer codes, or at least sharing codes with others in a team. Computer codes also need to be commented well enough for archival purposes so that if you or someone else needs to revisit the code at a later time, the comments provide sufficient information to understand (i) the basic flowchart of the code, (ii) the numerical methods used, (iii) what each of the variables represent including units for all numeric values defined, (iv) what quantities are being calculated, (v) the expected output, and (vi) and a description of each of the figures/tables generated.

An example of adequate commenting can be found in the instructor's code for the Cooling Tower (appended with the actual *coding commands* removed).

Table of Contents


```
%----------------------------------------------------------------------
% TFES Lab (ME EN 4650)
%
% Water Cooling Tower - Data Analysis
%
% Required Plots:
%    1a. Water temperature and wet bulb air temperature vs height
%        (indicate range and approach with dimension lines)
%    1b. Efficiency vs water inlet flow rate
%    1c. Specific and relative humidity vs height (and water inlet flow rate)
%    1d. Dry bulb temperatures vs height (and water inlet flow rate)
%    1e. Ratio of water outlet and inlet flow rates vs inlet water
%        temperature
%    1f. Heat transfer rate to air and surroundings vs inlet water
%        temperature
%
% Curve fit the makeup water flow rate to the inlet water temperature
%
% M Metzger
% 1-2022
%----------------------------------------------------------------------
```

RAW DATA (CHANGE FOR EACH LAB SECTION)

```
% Ambient temperature and barometric in the lab
Tamb = 21.2;       %oC
Pbaro = (778-120.6)*133.332/1000; %kPa

% Measurements from raw data sheet --- copied from excel spreadsheet
Data = [31 41 18
23.7 23.6 23.7
12.2 12.1 12.1
23.5 23.1 22.9
20.9 20.9 20.6
29.9 27.6 37.3
18.3 18.6 16.8
21.4 21.8 21.4
20.8 21.5 20.2
25.8 24.9 26.7
18.5 19.3 17.6
```

```
19.8 20.2 19.1
22.4 22.1 20.9
15 16 14.5
20.5 20.9 21
18.5 19.1 16.5
21 21 21
10.5 10.5 10.5];
```

POST PROCESSING DATA (DO NOT CHANGE ANYTHING BELOW THIS LINE)

```
% parse data into separate physical quantities
 [ENTER YOUR VARIABLES]      %inlet water flow speed (kg/s)
                             %T1, air inlet temperature, dry bulb (oC)
                             %T2, air inlet temperature, wet bulb (oC)
                             %T3, air outlet temperature, dry bulb (oC)
                             %T4, air outlet temperature, wet bulb (oC)
                             %T5, water inlet temperature (oC)
                             %T6, water outlet temperature (oC)
                             %t1, air temperature at H, wet bulb (oC)
                             %t2, air temperature at H, dry bulb (oC)
                             %t3, water temperature at H (oC)
                             %t4, air temperature at G, wet bulb (oC)
                             %t5, air temperature at G, dry bulb (oC)
                             %t6, water temperature at G (oC)
                             %t7, air temperature at F, wet bulb (oC)
                             %t8, air temperature at F, dry bulb (oC)
                             %t9, water temperature at F(oC)
                             %pressure drop at air inlet (mm H20)
                             %pressure drop at air outlet (mm H20)

% number of different inlet water flow rates
[ENTER YOUR VARIABLES]

% create arrays for air temperature (wet and dry bulb) and water
% temperature as a function of height for ease of analysis and plotting

[ENTER YOUR VARIABLES]
```

Fixed parameters in experiment

```
% input power to water heaters (W)
Qin = 1.6e3;

% vertical heights of measurements relative to inlet (m)
z = [0,0.248,0.483,0.71,1.0];
```

Calculate performance quantities

```
% use Psychrometric function to get moist air properties at each location
```

```
for ([ENTER YOUR VARIABLES])
    for ([ENTER YOUR VARIABLES])
        [Tdb,w,phi,h,Tdp,v,Twb]=...
            Psychrometrics([ENTER YOUR VARIABLES]);

       [ENTER YOUR VARIABLES]  %specific humidity (kg/kg of dry air)
                               %relative humidity (%)
                               %enthalpy (j/kg of dry air)
                               %dew point (oC)
                               %specific volume (m^3/kg of dry air)
    end
end

% Range: Tw_in - Tw_out (oC)
[ENTER YOUR VARIABLES]

% Approach: Tw_out - Twb_in (oC)
[ENTER YOUR VARIABLES]

% efficiency: R/(R+A)*100 (%)
[ENTER YOUR VARIABLES]

% convert pressure drops to flow rate of DRY air using manufacturer's
% discharge coefficient (kg/s).
[ENTER YOUR VARIABLES]

% inlet mass flow rate of water vapor
[ENTER YOUR VARIABLES]

% outlet mass flow rate of water vapor
[ENTER YOUR VARIABLES]



% outlet mass flow rate of water
[ENTER YOUR VARIABLES]

% mass flow rate of makeup water
[ENTER YOUR VARIABLES]



% rate of heat gained by the air (kW)
[ENTER YOUR VARIABLES]

% rate of heat lost to the surroundings
[ENTER YOUR VARIABLES]
```

Generate required plots

```
% 1a. Water and wet bulb temperatures vs height at intermediate water inlet
% flow rate
figure;
[ENTER YOUR CODE HERE]




% draw the range and approach lines
[ENTER YOUR CODE HERE]




%1b. Efficiency vs water inlet flow rate
figure;
[ENTER YOUR CODE HERE]


% 1c. Specific humidity vs height (and water inlet flow rate)
figure;
[ENTER YOUR CODE HERE]


% 1d. Dry bulb temperature and water temperature vs height (and water inlet
 flow rate)
figure;
[ENTER YOUR CODE HERE]


% 1e. Ratio of water outlet and inlet flow rates vs inlet water
%     temperature
figure;
[ENTER YOUR CODE HERE]


% 1f. Heat transfer rate to air and surroundings vs inlet water
%     temperature
figure;
[ENTER YOUR CODE HERE]
```