kB = 8.617e-5; % in eV/K

Ef = 0.56; % Fermi level in eV

E = -0.2:0.0005:1.4; % Energy levels

% "Calculate" f(E) at T=0 K as fTo

fTo = zeros(size(E));

for k=1:length(E)

if E(k)<Ef

fTo(k)=1;

elseif E(k)==Ef

fTo(k)=0.5;

end

end

% Calculate f(E) at three different temperatures

T1 = 100; % in K

T2 = 200;

T3 = 300;

fT1 = 1./(1 + exp( (E-Ef)/(kB\*T1)));

fT2 = 1./(1 + exp( (E-Ef)/(kB\*T2)));

fT3 = 1./(1 + exp( (E-Ef)/(kB\*T3)));

% Plotting the graph

figure(1); clf

plot(E,fTo,'k', 'LineWidth',3);

grid on;

hold on

plot(E,fT1,'b','LineWidth',2)

plot(E,fT2,'r-.', 'LineWidth',2)

plot(E,fT3,'m:', 'LineWidth',2)

axis([-0.2 1.3 -0.1 1.1])

set(1, 'Position', [34 88 634 538]);

xlabel('E (eV)');

ylabel('f(E)');

title('Fermi-Dirac distribution functions at different temperatures')

legend('T=0 K','T=100 K','T=200 K','T=300 K', 'Location', 'SouthWest')

plot(Ef,0.5,'k.', 'MarkerSize',36)