

1. Plot the trajectory of a projectile (with and without viscous drag). Find the optimum angle so that the range is maximized in both the cases.
2. Write a program to compute centroids of parts of human body.
3. Plot the time period of a pendulum as the amplitude of oscillation increases from small to large (0 to  $\pi/2$ )
4. Plot the dynamics of a bouncing ball with a given coefficient of restitution.
5. Write a computer program to date solar and lunar eclipses during the last 100 years.
6. Can you track stars and planets using programs Google Earth, Kstar etc. Can you import the data and plot the trajectories of planets? Can you discover Kepler's laws of planetary motion using this data?
7. Compute the lengths of day and night at given latitude (your hometown) and plot it for year. When are these equal?
8. Write a program to plot the time response of an RC and RL circuit for a square input signal (Low = -5 V, High = +5 V). Upload the plots obtained (for the three frequencies and R-C and R-L values mentioned in your lab manual).  
It would be preferable if  $V_c$  and  $V_r$  could be shown in the same figure as two plots one below the other. Superimpose input waveform on output waveforms for better visualization. Upload only images of the plots with correct names. Eg. RC\_100Hz.png (or RC\_Vc\_100Hz) for RC circuit, output voltage  $V_c$  at 100 Hz.
9. Does your weight vary with latitude (on where you measure?)? If it does, plot it with latitude. (You may use graphics library "matplotlib" in python <https://www.anaconda.com/> or any other software of your choice)