

Appendix V Graphing using Excel 2007

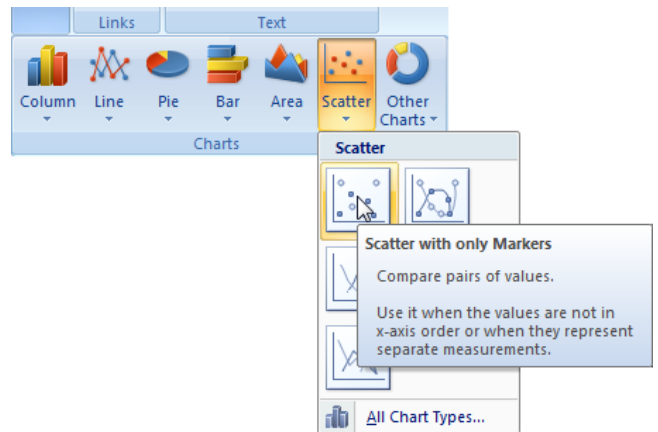
The following instructions are meant as a guideline to plot a set of data with error bars in the y-axis. The data and error values given in this appendix are examples and are not to be used as values in the graphs which you are to create. By following the steps and using your data from Table A – C you should be able to create three individual graphs for $(\text{Velocity})^2$ vs each of the varied variable of F_c , R and $1/m$. The uncertainty for V^2 for each graph should be determined from each respective data table by taking the average of the 5 uncertainty values. Each graph should also contain the data points $(0,0)$.

This example will create a graph of Velocity v. Time, with the velocity value having an uncertainty of 0.05 m/s.

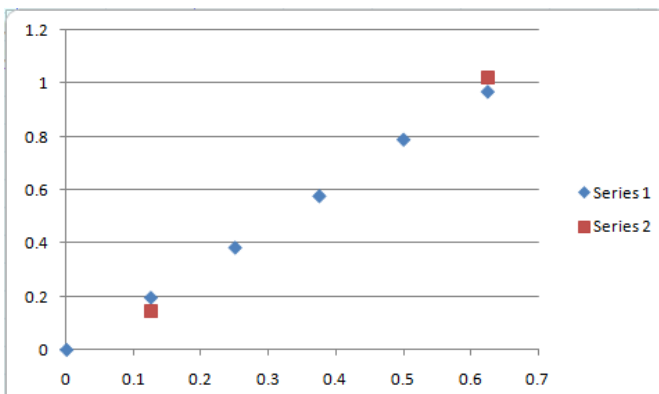
The x axis value, time, will be entered into the first column. The velocity values are entered into the second column. These two columns will allow a best fit line to be created. To create a worst fit line, data will need to be entered into the third column. This data is determined by adding the uncertainty to the largest value of velocity and subtracting it from the smallest value of velocity. In this example 0.05 was added to 0.97 and subtracted from 0.196.

	A	B	C
1	0	0	
2	0.125	0.196	0.146
3	0.25	0.384	
4	0.375	0.578	
5	0.5	0.79	
6	0.625	0.97	1.02

Select the data. Then select the Insert Tab. From the Charts Tab make the selection shown to the right.

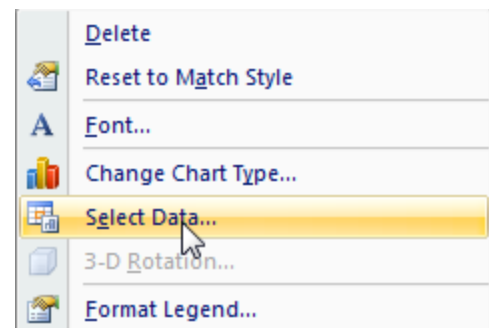


Once the selection is made a graph will be created.



When the graph is selected Chart Tools will appear in the upper Tool Bar.

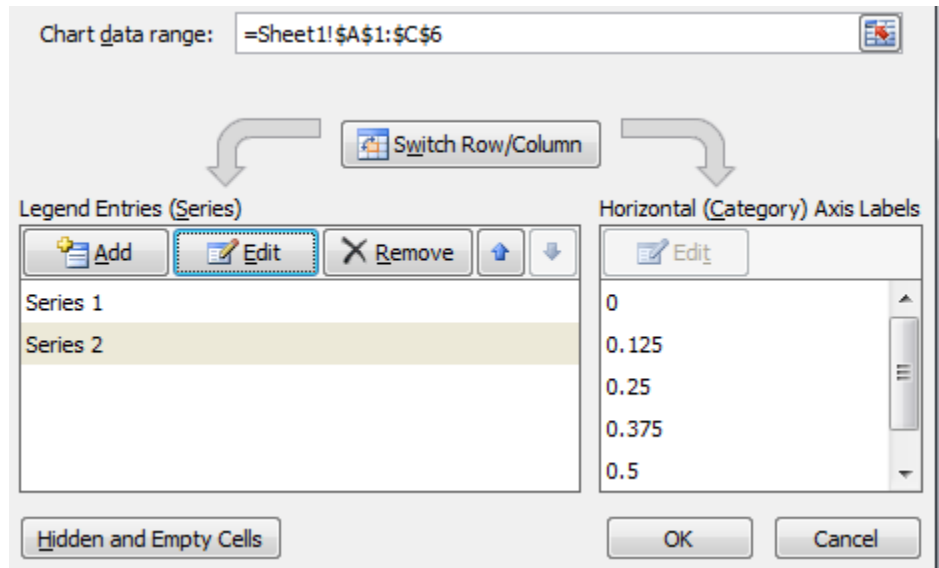
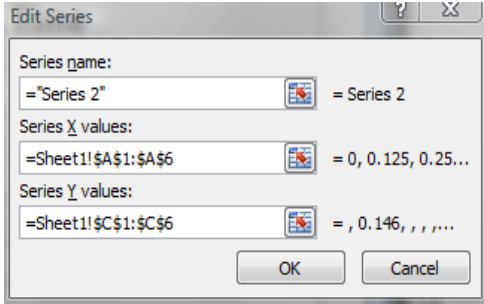
Position the mouse over the label Series 1 and Series 2. Right click and then choose from the pop up menu Select Data.



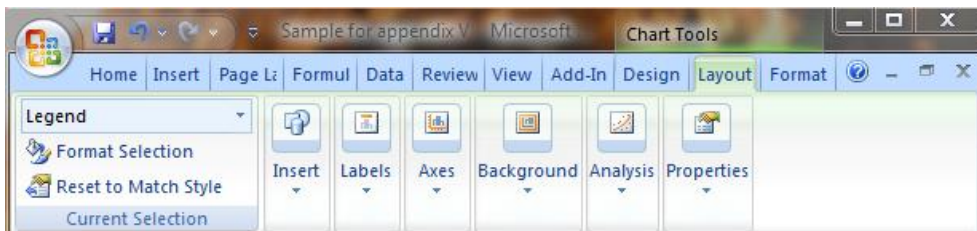
Select Series 1 then Edit and under Series Name add the phrase Best Fit.

Select OK.

Next do the same for Series 2 except change the name to Worst Fit.

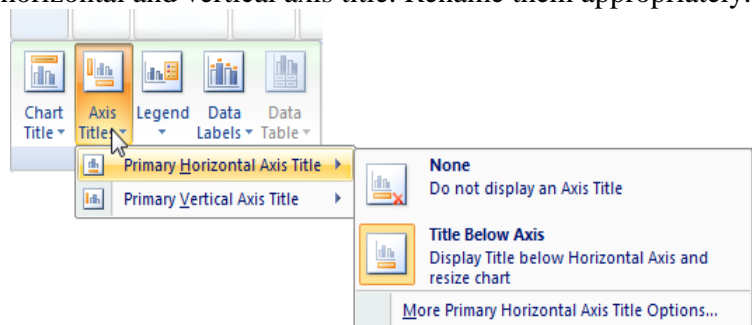
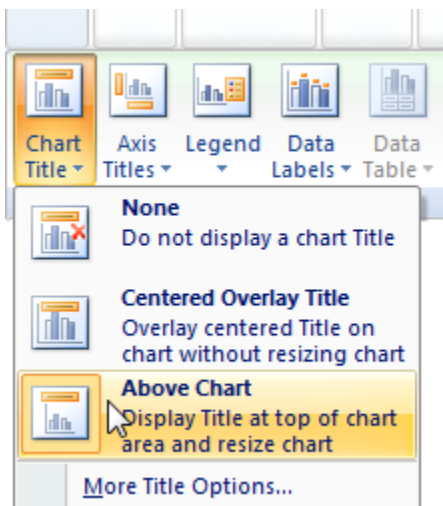


To add a Title and axis labels select the Layout Tab.



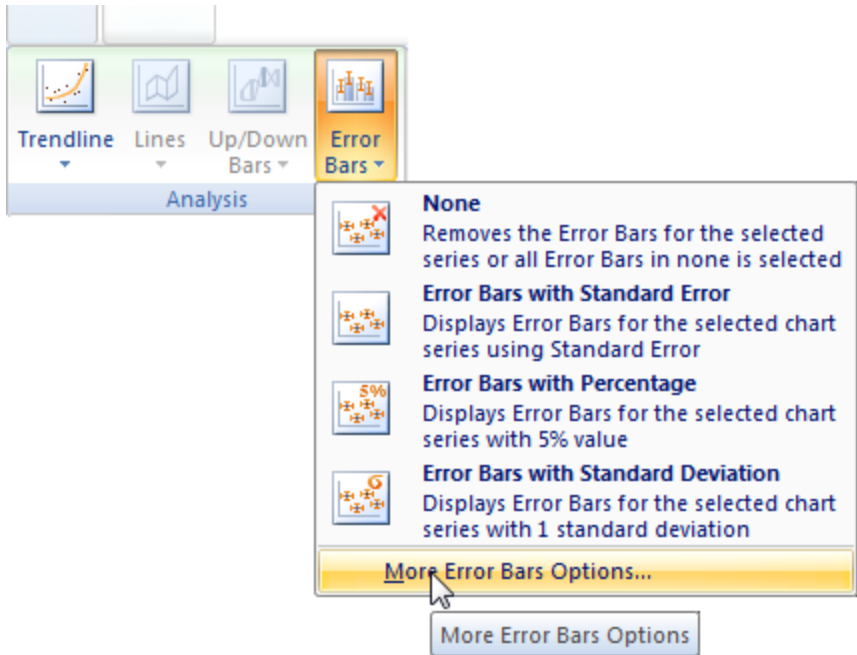
Now select the Labels tab. From here choose Chart Title then Above Chart. Rename the Chart Title to an appropriate name for the graph.

Now select Labels and choose Axis Titles, add a horizontal and vertical axis title. Rename them appropriately.



Next to add the error bars to the graph.

While still under the Layout Tab choose the Analysis Tab and select Error Bars. From this choose More Error Bars Options.



Select Add Error Bars based on Best Fit. Direction should be both and End Style as Cap.

With Fixed value selected the value for it will need to be changed to the uncertainty for the y-axis value. In this example that uncertainty is 0.05. For your data this value is the average of the V^2 uncertainty values.

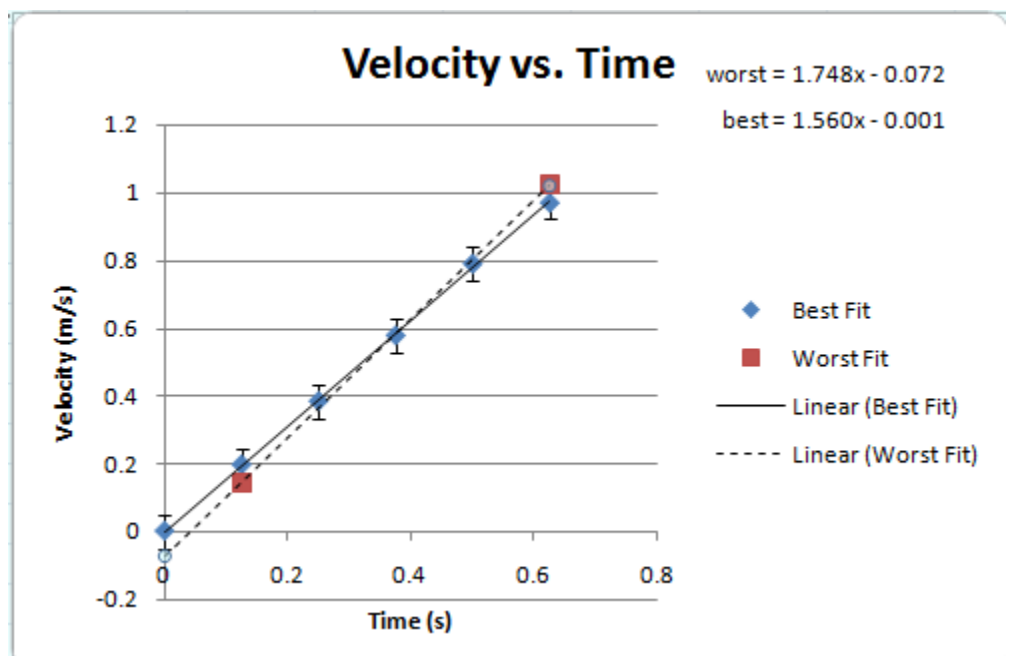
Once the close button is selected two sets of error bars will appear in the graph a vertical and horizontal set. Select one of the horizontal error bars and press the delete key. This should remove all of them from the graph leaving only the vertical error bars..

The final steps are to add a best and worst fit line.

Once again under the Layout Tab select the Analysis Tab and then Trend lines.

Add two Trend lines based upon the best and worst fit. Once the trend lines are on the graph, position the mouse pointer over the best fit trend line, a small message window should appear indicating when the mouse is position over the line.

Right click and select format trend line. From the Window that appears select Display equation on Chart. Once the equation is on the chart delete



the y variable and rename it to best fit. Repeat the process for the worst fit line. For the worst fit line you should also change the line style to a dash line. Reposition the equations to a convenient place on the graph.

The graph should now resemble the one shown here. Keep in mind that you will be graphing V^2 vs. either F_c , r or $1/m$.