# EXCEL TUTOR FOR Ex. 18.5

## Entering Data for the Light Curve

1. First open EXCEL by clicking on the EXCEL green icon on the main page or the bottom menu bar.
2. Click on the box in column A row 1. Values in column A are plotted along the x-axis.
3. Type the first data entry, e. g. phase, in the box on row 1 under column A. Make sure that phases are placed in order from 0.01 to 0.999 or EXCEL will not plot the data correctly.
4. Tab to column B and enter the corresponding value for the y-axis, e. g. flux.
5. Press Enter to get to the next blank row and continue entering all the other data
6. Copy all data with phases between 0.00 and 0.12 and add these data at the end of both columns. Now add 1.00 to the phases for these extra data points but do not change the flux data. For example, phase 0.0123 becomes 1.0123. To do this click on the first box in column A of the repeated data and type: =A1+1. Then press enter. Then click on dark square in the lower right corner of the box and drag down the column to the end of the data. This will then add 1 to the phases. This is done so that we see more than 1 orbital cycle on the graph, which makes it easier to analyze the light curve.

## Plotting Light Curve Data

For Ex. 18.5, you will plot two light curves. The first graph is a plot of orbital phase along the x-axis and absolute flux along the vertical axis. The absolute flux data are the values you read from the spectral images. The corresponding orbital phase for a spectral image is taken from Table I in Ex. 18.5 itself.
The second graph is for the normalized light curve, which is generated as explained below.

7. Click on column **A,** and drag over to include columns **B.** These data are now highlighted in blue.
8. Click on "Insert" in the tool bar at the top of the page.
9. Now click on the option **"scatter"** in the charts section. This will open a new window of options. Click on the sample picture showing just data points to be plotted instead of a line connecting the data points.

### Absolute Flux Light Curve:

Now, for the absolute flux light curve, right click on one of the numbers along the y-axis and in the menu that opens, select "Format Axis." Next, click on the circle for the major unit labeled "fixed" and change the number to 0.50. Next, click on the circle to fix the value of the minor unit to 0.10. This will provide you with a scale that is easier to read the mean flux level of the data.
Now click on "Layout", not "Page Layout", in the top menu bar, and then click on the icon for "gridlines. Next, click on "major horizontal gridlines," followed by clicking on the icon to display both major and minor horizontal gridlines.

Now right click on one of the numbers along the horizontal axis and in the menu that opens, select format axis. Next, click on the major unit circle for "fixed" and change the number to 0.10 and the minor unit to 0.02
Now click on Layout in the top menu bar and then click on the icon for "gridlines. Next, click on "major vertical gridlines," followed by clicking on the icon to display both major and minor vertical gridlines.
Follow the same procedure when you format your normalized light curve, except the flux scale will be from 0.0 to 1.10.

Now proceed to step 10 to prepare your graph for printing and then print it.
**This will be printout 1.**

## Formatting a Graph

To dress up a plot to be printed and handed in or included in a report, proceed as follows:

10. Click on the graph and then on "Layout", not "Page Layout", in the top menu bar.
11. Now click on the "axis title" icon and select the primary horizontal and vertical axis options in turn. Under horizontal axis choose "title below axis" and for the vertical axis title choose "rotated title."
12. Enter "Orbital Phase," in the horizontal axis text-box labeled "axis title" and enter "Absolute Flux," or "Normalized Flux," in the vertical axis text-box. You should also give the graph a title such as "Absolute Flux Light Curve" or "Normalized Flux Light Curve."
13. Then go to "Home" and change the font to "Times New Roman," size 16.
14. Click on the box to the right of the plot area that says "Series 1" and then press the delete key.
15. Now click on the corners of the frame encapsulating your graph and stretch to maximum size on the available screen area.
16. Now right click on the plot area **between the lines** and then on one of little squares that appears at the edge of the plot area. Now drag to enlarge the plot area within the graph window to maximize it without crowding the axes labels.
17. Now click on the tab in the upper left corner of the screen labeled "FILE" and then select print. The print preview should open and you can see how your graph fills the page. If the graph is to be a single page in your report, adjust the size until it fits the entire page. Also set your print options to have the graph be in landscape format. Before you print, have your instructor check your chart to make sure it is correct. Then print the graph.

## Producing A Normalized Light Curve for Ex. 18.5

After you have printed your graph of the observed absolute flux versus phase, inspect the plot to determine the average value of the flux outside of the eclipses. Be sure to allow for random errors in your measurements. This is the value for NF, the normalizing flux, which is to be recorded on the answer page.

Now proceed to plot a normalized light curve.

1. Click in the blank space in column C, row 1 and type the following in the space: =B1/NF, where NF is the numerical value you obtained for normalizing the flux.
2. Press Enter. The value in row 1 of column B divided by the value NF should appear in the box for column C, row 1.
3. Now click on the above box and then click on the small black square in the lower right hand corner of the box and drag down to the end of the data. The other values of Column B divided by NF should now fill in all rows of column C.
4. Now click on column **A, t**hese data are now highlighted in blue, then hold down the "Ctrl' key and click on the heading-letter of column C or whatever data you want to plot. Now proceed to plot the data as in instruction #9, except now the maximum range along the y-axis should be 1.10, the major unit should be 0.10 and the minor unit 0.02. This is the normalized light curve.

Now go to step 10 to prepare your graph for printing and print it after checking with your instructor.

Now proceed to analyze your normalized light curve as explained in the manual.

**For Ex. 20: Plotting a Radial Velocity Curve:**

**C**lick on the top leftmost option, which is a graph without curves connecting the data points. When you do this your data will be plotted.

1. To add another series of data to the graph, such as a profile fit or measured data, proceed as follows:
   Right click anywhere near the edge of the graph and then click on "select data."
   In the new window, click on "add" In the series window box, type a name that you wish to give to the data series. Then click on the square button at the end of the window and then again.
   2. Now click on the button for the x-axis and then click on the letter of the column of data containing the x-axis data. Click on the button again and repeat for the y-axis data. If there is another column of y-axis data to be added, repeat all of the above. Then click on "ok" twice.

   3. For measured data, you want to have just symbols for your data points and not a connecting line. To change the type of graph right click on the curve and select "change series type." Then click on the single data points type of graph under "xy-scatter." To change the type and size of the symbols, right click on the plotted symbols in the graph and now select "format data series," then "marker options," then "built in," and then select the type of symbol and size. Make the size to be 2.

**Y value for Location of x-axis data labels.**

   4. To have the x-axis data scale moved to the bottom of the plot when you have y-data that goes negative, right click on one of the y-axis label numbers. A menu opens and select format axis.

   5. Then click on the choice to enter the value for x-axis to cross the y-axis. Type in the y-axis value and then close.