

# FFT IN EXCEL:

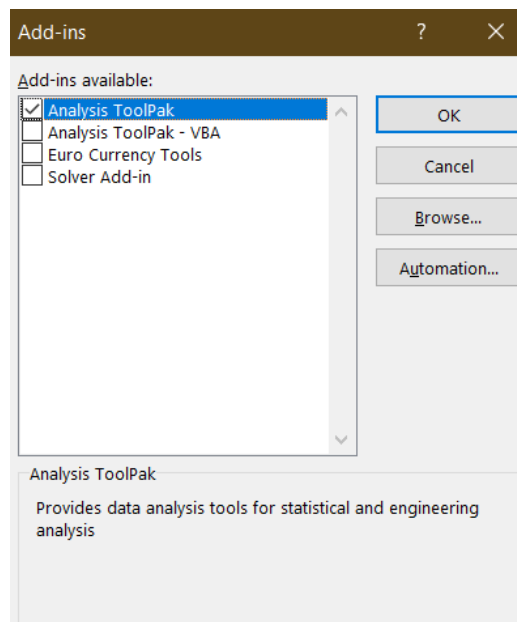
## INPUTS:

The inputs must be in separate columns containing the time, X -Axis and Y -Axis data. Like this:

	H	I	J
	Time	DATA - X	DATA - Y
	0	0.846055212	0.568021352
	1	0.177611868	0.312074024
	2	0.195563038	0.592176379
	3	0.889125736	0.313843271
	4	0.354602211	0.722310979
	5	0.280934206	0.641682625
	6	0.863441471	0.349909965
	7	0.308955587	0.751970155
	8	0.260010334	0.594757028
	9	0.200056724	0.58940611
	10	0.5552143	0.394447318
	11	0.275721015	0.325203866
	12	0.624254372	0.511772784
	13	0.610752338	0.647962851
	14	0.197415321	0.457503275
	15	0.178838869	0.777335215

## DATA ANALYSIS PACK:

For calculating FFT in excel we must add the File -> Options -> Add-Ins -> Manage: Excel Add-Ins -> Go  
Then choose the 'Analysis ToolPak' and then install.



## FFT:

For applying FFT, we must select the Data Analysis tool in Data menu. In the pop-up window, we must select the input data for which we want the FFT. The number of elements must be in powers of 2 for the function to work. We must also select where we want to paste the FFT results. After choosing both, the menu looks like this:

Fourier Analysis

Input  
 Input Range:    
☐ Labels in First Row

Output options  
☒ Output Range:    
☐ New Worksheet Ply:   
☐ New Workbook  
☐ Inverse

## FREQUENCY RANGE:

The frequency is related to the sampling frequency and the number of samples. The time of each sample is divided by  $N/F_s$ , where  $N$  is the number of samples and  $F_s$  is the sampling frequency. When each value is divided by this term, we get a column containing all frequency ranges required. For easier calculations,  $N$  and  $F_s$  can be saved in a cell and then referring to them for division.

H	I	J	K
Time	DATA - X	DATA - Y	FFT frequency
0	0.846055212	0.568021352	0
1	0.177611868	0.312074024	0.000488281
2	0.195563038	0.592176379	0.000976563
3	0.889125736	0.313843271	0.001464844
4	0.354602211	0.722310979	0.001953125
5	0.280934206	0.641682625	0.002441406
6	0.863441471	0.349909965	0.002929688
7	0.308955587	0.751970155	0.003417969
8	0.260010334	0.594757028	0.00390625
9	0.200056724	0.58940611	0.004394531
10	0.5552143	0.394447318	0.004882813
11	0.275721015	0.325203866	0.005371094
12	0.624254372	0.511772784	0.005859375
13	0.610752338	0.647962851	0.006347656
14	0.197415321	0.457503275	0.006835938
15	0.178838869	0.777335215	0.007324219

## MAGNITUDE OF FFT:

The plot should show the magnitude of each frequency, so we must take the absolute value of the data and then plot it against the frequency.

To take the absolute value of the imaginary value, the function IMABS() is used. The function is applied on one cell and then dragged all the way to the end so, it is applied on the values. After this the sheet looks like this:

H	I	J	K	L	M	N	O	P
Time	DATA - X	DATA - Y	FFT frequency	FFT X - 2048	FFT Y - 2048	X magnitude	Y magnitude	
0	0.846055212	0.568021352	0	1026.63305610066	1141.43008807996	1026.633056	1141.430088	
1	0.177611868	0.312074024	0.000488281	-5.52138226907061-2.12664891585744i	0.24560945376502-6.31410859382873i	5.916781031	6.31888371	
2	0.195563038	0.592176379	0.000976563	5.61902538347198+2.22237256024927i	-0.924611936930144-3.85939565590409i	6.042547977	3.968607068	
3	0.889125736	0.313843271	0.001464844	-1.19535400503116-10.5799972054945i	-11.604454820966-2.74672456034102i	10.64731009	11.92509402	
4	0.354602211	0.722310979	0.001953125	-1.33975876396836-4.51249415177555i	1.18882775182718+8.90149572747143i	4.70718143	8.980531032	
5	0.280934206	0.641682625	0.002441406	-1.73749855528698+9.4676078841505i	12.5608354982779+0.334517448362552i	9.625720767	12.56528911	
6	0.863441471	0.349909965	0.002929688	5.58002354086753-0.663247936368077i	-8.21933476858009+6.16269282169621i	5.619302496	10.27308361	
7	0.308955587	0.751970155	0.003417969	9.91018509819607-1.03336599194791i	4.31123908539049+6.67586887632593i	9.963915593	7.946949585	
8	0.260010334	0.594757028	0.00390625	-8.24735182244962+3.05014398678882i	-3.65420822458646-6.49110419385366i	8.793303726	7.449004726	
9	0.200056724	0.58940611	0.004394531	1.55893918922816-1.37243352819836i	-8.17306265506293-9.11008647268327i	2.076984638	12.23897989	
10	0.5552143	0.394447318	0.004882813	-5.07698324259325-1.77502400705554i	2.94079740292116-4.4199326815541i	5.378333299	5.308869397	
11	0.275721015	0.325203866	0.005371094	-2.57683481263317+1.42280459857335i	1.07298149662468-7.9357572240253i	2.943543881	8.007966784	
12	0.624254372	0.511772784	0.005859375	1.26609247906376-8.51809698174191i	-3.38325713698935-2.53560338279457i	8.611676164	4.227967995	
13	0.610752338	0.647962851	0.006347656	8.42120161488844+8.52703478791909i	9.74284409013459+6.42488777957297i	11.98444654	11.67056956	
14	0.197415321	0.457503275	0.006835938	-14.8020033349155+2.39888582415595i	8.53293902021964+0.115720278642139i	14.99513107	8.53372366	
15	0.178838869	0.777335215	0.007324219	-2.32042852578357-2.91857130440672i	0.195568597170665-2.8493954958994E-002i	3.728598531	0.197633453	
16	0.691179633	0.458369767	0.0078125	-1.41387089920865-15.8921485313355i	-3.22784692657442-4.53271632806004i	15.95491823	5.564576632	
17	0.267590924	0.731742307	0.008300781	-7.91208211369531+1.32136138214044i	2.40597335869327+9.44005359983042i	8.021660631	9.741833491	
18	0.699294589	0.65264327	0.008789063	-2.31504614839583+7.03480998854509i	-4.46894733991188+7.88373011436125i	7.4059429	9.062267423	
19	0.40937166	0.795208651	0.009277344	-2.38853039878464-2.69612974089401i	-1.31486192754661+2.06054524687821i	3.601970717	2.444321706	
20	0.781446429	0.438983603	0.009765625	-0.502282936218774-7.10008684872796i	8.57947859395729+2.42012777789909i	7.117831229	8.914284683	
21	0.889123385	0.321445995	0.010253906	3.3199478489691-1.45075230490082i	-7.80231765534781-4.53202778838674i	3.623083765	9.023050297	
22	0.222502716	0.721347826	0.010742188	5.87718909283237-9.83281785781735i	9.62505813387835+1.87734349486939i	11.45537684	9.806434759	
23	0.837054115	0.620188159	0.011230469	6.30925659960869+7.41598191599423i	-4.79276257350219-0.319925877900728i	9.736709229	4.803428531	
24	0.551574661	0.519305636	0.01171875	14.4878609080882-0.472341174285976i	1.5275372046497+1.62312136129345i	14.49555863	2.228877041	
25	0.383164728	0.55332167	0.012207031	-4.912799669144-6.91117159806839i	-1.57154130068927-0.698229755851804i	8.479380487	1.719670565	

## PLOT:

The frequency spectrum is obtained by plotting the X and Y magnitudes vs the frequency. Only the first half of the columns are taken, because after the halfway point, the peaks begin to repeat itself. The desired plotting style can be chosen from the Insert Chart menu. The final output looks like this.

