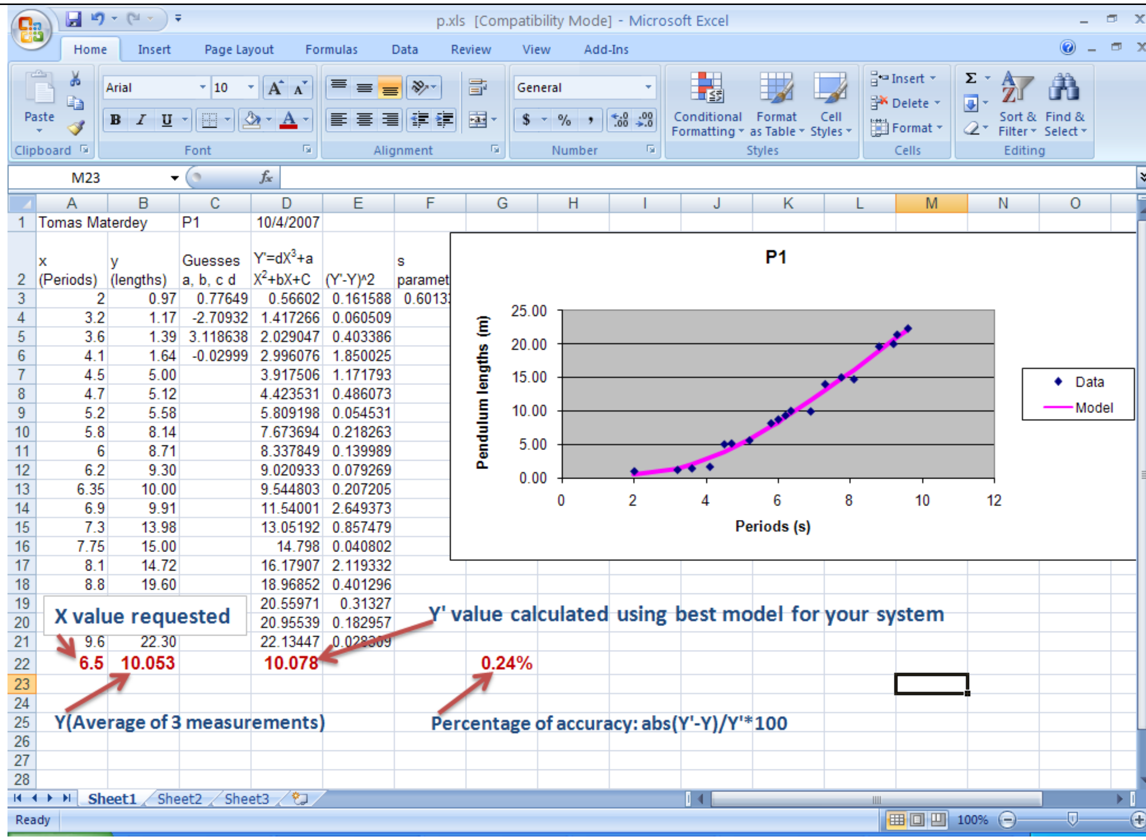
Engin 103 March 9, 2010 back to e-syllabus	Topics: Project 1 -Part II Presentations Logbook questions

Project 1 Part II Presentations: Data Modeling and System Predictability Testing

Excerpt from Project 1 specifications (see link in e-syllabus): *"In the second day, you will show the class the predictability of your system. The predictability will be checked as follows: you will be required to show a sufficient (at least 10) number of data (X,Y)'s you measured using your system, and the best model or equation Y'=f(X) you found with Excel in relating these data. Next you will be required to use this model to make a prediction Y' for some new value X, given by the audience, with your model. Next you will run your system for that input X, obtaining the actual output Y. Your system will be considered predictable if Y' and Y differ by less than 10%."*

Project 1 leaders: please copy this document and fill in your team response below. Then save as a web page: name "p1p2.html" and upload to your *files* folder.

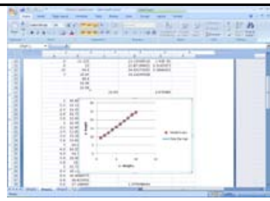


	A	B	C	D	E	F	G
1	Tomas Materdey		P1	10/4/2007			
2	x (Periods)	y (lengths)	Guesses a, b, c d	Y'=dX^3+a X^2+bX+C	(Y'-Y)^2	s paramet	
3	2	0.97	0.77649	0.56602	0.161588	0.6013	
4	3.2	1.17	-2.70932	1.417266	0.060509		
5	3.6	1.39	3.118638	2.029047	0.403386		
6	4.1	1.64	-0.02999	2.996076	1.850025		
7	4.5	5.00		3.917506	1.171793		
8	4.7	5.12		4.423531	0.486073		
9	5.2	5.58		5.809198	0.054531		
10	5.8	8.14		7.673694	0.218263		
11	6	8.71		8.337849	0.139989		
12	6.2	9.30		9.020933	0.079269		
13	6.35	10.00		9.544803	0.207205		
14	6.9	9.91		11.54001	2.649373		
15	7.3	13.98		13.05192	0.857479		
16	7.75	15.00		14.798	0.040802		
17	8.1	14.72		16.17907	2.119332		
18	8.8	19.60		18.96852	0.401296		
19				20.55971	0.31327		
20				20.95539	0.182957		
21	9.6	22.30		22.13447	0.028309		
22	6.5	10.053		10.078			0.24%

The figure above is an example of what the team should present in their spreadsheets during Project 1 –Part II

Section 1 (9:30 AM)

Team #	Snapshot of Spreadsheet showing best mathematical model for your system	a) Your best model" A=; B=; C=; D= b) What are the requested X= and predicted output Y'= along with their units	c) List the three values obtained Y_1=; Y_2=; Y_3=; d) List their average Y_{av} e) $\lvert Y'-Y_{av}\rvert / Y_{av} *100=$ %	f) Explain your thoughts on what design elements most influenced the predictability obtained g) Explain what can be done to further improve its predictability
1 section 1		A=-0.0567933	Y1=10.59749636	The S value is the smallest with the cubic values and shows the best fit on the graph
2 section 1		A=1.412084 B=0.41646 C=0.516823 D=0.950668 X in unit meter, and Y' in unit Second	c) Y_1=1.385 s Y_2=1.39 s Y_3=1.372 s d) $Y_{average}$=1.382 s e)abs(1.35-1.382)/1.382=0.02315	f) 1.human error: came into effect when we were releasing the ball. (including the angle when we were releasing it) 2. The air friction. g) To make it more easier to change its length.
3 section 1		a)	b)	c)
4 section 1		a) A = 12.51728893 B = 59.63423715 b) X = $5.25 Y' = 125.350004	c) Y_1= 135 Y_2= 133 Y_3= 127 d) Y_{avg} = 131.6666667 e) $Y'-Y_{av}\rvert/Y_{av}$ *100= 5.04%	f) Using an adhesive and bonding the washers used as spacers together greatly helped increase the predictability of the system. g) Making the spacing washers completely immobile would help increase the predictability. Also cleaning, polishing and lubricating the blade and washers would increase the predictability.

5 section 1		**a)Cubic** **A=** 0.087797522 B=1.208757383 C=8.069554359 **D=**-0.004373144 **b) X Requested – 7rods** **Y’ = 19.33294628 in.**	c) Y1= 19.5 Y2=19.56 Y3=19.56 d) Y avg= 19.54 e)[Y’-Yav]/Yav *100 = 1.07%	f) I think that having the device set on the table and only having it move in one direction really helped. By only moving downward it was very predictable that it would get longer. g) I think that a longer and tougher spring would help its predictability. There is only so much weight that can be added before the spring will give out. In theory its predictable, nut in real life the spring can only take so much
6 section 1				
7 section 1		a)	b)	
8 section 1		Best Model A= -0.8436 B= 19.3374 C= -0.3776 D= -1.0805 ______________ Class Requested X input = 75 Degrees which the spreadsheet converts to 1.308996939 Radians. Our Model predicts that setting the X input to 75 Degrees will give us a Y output of 21.0659 seconds	Y1= 21.4 sec Y2= 22 sec Y3= 21.2sec _____________ Avg = 21.53sec _____________ Accuracy 2.22%	Design Elements that helped influence predicitbility. a. Attaching the protractor along the pendulums radius. b. Attaching a pointer that helped identify accurately where the pendulum was on the protractor. c. Making a pendulum that could only travel on a straight line by attaching it to an axel. d. Adding ANSI ball bearings to reduce friction and enhance mobility. I think that in order to improve our design I could have welded in place the spacer washers that held the axel in place with the ball bearings. I also

		(until the pendulum comes to a rest).		would have liked to create a release device and stopwatch trigger to reduce the involvement of human hands and increase accuracy.
9 section 1		a) Your best model" A=; B=; C=; D= Y' = -11.35506*X^3 + 0.04595*X ^2 - 1.45265*X + 16.52825 A = -11.35506 B = 0.04595 C = 1.45265 D = 16.52825 b) What are the requested X= and predicted output Y'= along with their units X value requested = 12.25 Y' = 57.61065101	c) List the three values obtained Y_1=; Y_2=; Y_3=; Y (experimental data) Y1 = 54.5 Y2 = 56.0 Y3= 56.5 d) List their average Y_{av} Y (average of measurments) = 55.66666667 e) $\|Y'-Y_{av}\|/Y_{av}$ *100= 3.37%	f) Explain your thoughts on what design elements most influenced the predictability obtained Team 9's use of carbon paper to record experimental data greatly increased our system's predictability. Other than this materials choice, we maintained a smooth, bump-free marble canal meaning that our gain in kinetic energy by jump point was extremely predictable. g) Explain what can be done to further improve its predictability We could have used a (more expensive) mechanism to release each marble with zero initial velocity, rather than employing hand feeding of the marbles to the launch canal.
10 section 1				

Section 2 (2:00 PM)

Team #	Snapshot of Spreadsheet showing best mathematical model for your system	h) Your best model" A=; B=; C=; D= i) What are the requested X= and predicted output Y'= along with their units	j) List the three values obtained Y_1=; Y_2=; Y_3=; k) List their average Y_{av} l) $\lvert Y' - Y_{av}\rvert / Y_{av}$ *100= %	m) Explain your thoughts on what design elements most influenced the predictability obtained n) Explain what can be done to further improve its predictability
1 section 2				
2 section 2				
3 section 2				
4 section 2				
5 section 2		i.)		
6 section 2				
7 section 2				
8 section 2				
9 section 2				
10 section 2				

Report for team #			
Submitted		On time	Late
Uploaded electronic copy		Yes	No
Project 1 web page		Yes	No
Team participation table		Yes	No
Report submitted (80)	Progress Report: p1pr.html (5)		
	p1p1.html (5)		
	p1p2.html (5)		
	Introduction (10)		
	Design/Building (25)		
	Analysis: Spreadsheets		

	(20)	
	Conclusions (10)	
Good writing practices (20)	Grammar and presentation (5)	
	Logical arguments and structures (5)	
	Accurate, completeness; non-plagiarism (10)	
Deduction		
Project report total (100)		
Project presentation total (200)		Performance and Design (180):
		Web pages Parts I and II (20):
Project 1 total (300)		

Section 1

Project 1 -part II P&D/ Teams	1	2	3	4	5	6	7	8	9	10
9-Mar-10	Pendulum	Pendulum	Car on Ramp	Seesaw	Spring Scale	Ball on Ramp	Ball on Ramp	Rigid-Arm Pendulum	Ball on ramp	Scale
Percentage error	2.67%	2.19%	1.29%	5.04%	1.07%	10.26%	10.83%	2.22%	3.37%	1.59%
Project completed (35)	35	35	35	35	35	35	35	35	35	35
Spreadsheet and data modeling (15)	15	11.25	15	11.25	15	15	11.25	15	18.75	15
System predictability (25)	17.5	20	25	12.5	25	10	10	20	15	22.5
Presentation (15)	15	15	15	15	15	15	15	15	15	15
Total part II P&D (90)	82.5	81.25	90	73.75	90	75	71.25	85	83.75	87.5

Section 2

Project 1 -part II P&D/ Teams	1	2	3	4	5	6	7	8	9	10
Project completed (35)										
Spreadsheet and data modeling (15)										
System predictability (25)										
Presentation (15)										
Total part II P&D (90)										

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LOGBOOK: example of a logbook page

-Use a quadrille notebook; number all pages; date all entries
-Write your notes for all activities, thoughts, problems and solutions, and learning conclusions related to Engin 103. You should write down progress, outcomes, and conclusions on projects and teamwork; conclusions from class work (including LabVIEW) and homework.
-In addition you should answer in the logbook all questions listed in these notes in blue, as shown below:

27) Insert the spreadsheet made by your team for the system presented. Make a table of the coefficients and parameter s for the different models considered by the team, similar to that submitted in CW4. Explain which model was chosen to be the best

and why.

28) For each of the other teams, list their predictability results (in percentage error between prediction and average measurement done in class) and try to critically relate these results with their system designs, based on your own points of view.

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