Engin 103
Logbook Questions
Spring 2011

Each student will keep an individual Engin 103 logbook. The logbook will be graded three times during the semester, and its submission will be required when you come in to take the final exam.

-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 the questions posted in the class notes and shown below**.** See example of a logbook page here **example of a logbook page.**

These questions are first posted in the class notes for each meeting (click on the corresponding date in the e-syllabus or below). They may refer to information contained therein. Questions #1 and #2 can be found in the class note for meeting #2, there are approximately two questions in each note thereafter.

Logbook	**Due**
Questions 1-16	**March 1, 2011**
Questions 17-32	**April 5, 2011**
Questions 33-50	**May 3, 2011**
Questions: 1-54	**Final Exam**

Class	Date **Class notes**	Logbook Questions
1	Jan. 25	
2	Jan. 27	**1) a)What engineering field has your team been assigned for project 0? How did you search for information to include in the oral presentation (Part I)? How did you and your team search for information on a specific project to present (Part II)?** **b) Explain in your own words what is a brainstorming process? Did you and your team perform a brainstorming session to generate ideas for Project 0, part I and/or part II? If yes, describe the session in one paragraph.** 2) Pick the right option below 1.- Know the deadlines for Project 0 — A I will check in the e-syllabus, there is still time — B 2.-

Although it was introduced in class, I am going to read carefully the instructions for Project 0 in the e-syllabus, then work with my team making sure we satisfy all the project requirements.	A
It was already introduced in class, for not wasting time I am going to research for information about the assigned field and deliver what I found to my team leader	B

3.-

As a team we will distribute the work, do our part without bothering the busy teammates, then present what each of us got when the project is due.	A
We will distribute the work, do our part checking on each other work, then a final presentation is put together before the project is due	B

4.-

I will get my teammate contact information from them to start working on the project today	A
I will wait for these information be posted on the course website	B

5.-

As a leader I called my teammate to set up a meeting, he did not pick up, that means he does not want to participate. I don't need to try again.	A
He did not pick up the phone when I called, I am going to leave a voicemail and will also send him an email	B

6.-

As a leader I sent an email to my team about when and where to meet, a member is missing, obviously he does not want to work.	A
To set up a meeting I will include my cell phone number in the email message, in case a member could not find the place or will be a couple of minutes late.	B

7.-

We put together a presentation, rehearsed, and ready, our team leader will have the file when the project is due	A
We are ready, I have the file and will send a copy to all my teammates in case there is a last minute emergency and I will be late for the presentation.	B

8.-

The night before the presentation I could not access the assignment from home. This is clearly not my fault since the web server is down	A
We print out at least one copy per team for important assignments such as project specifications and homework, so we can share in case the server is down the night before the due date.	B

3	Feb. 1	**3)** **(a)Which of the five categories of leadership skills summarized in Phase #4 of the brainstorming process is the most basic and important (in such a way that when the other four are absent, it will well help a team leader in Engin 103)? Explain your position in your own words.** **(b) Explain what leadership skills would have helped team 12 and team 13 in the Case Study #1 and #2 above, support your claim with reasons and by referring to specific circumstances in the Case Studies.** 4) (a) **Teamwork: for each question below select which option is right for a good teamwork, A or B?**

Q#	A	B
1	Additive	Complementary
2	Reserved	Open
3	Independent	Interdependent
4	Inquisitive	Defensive
5	Complacent	Discontent
6	Persevering	Impatient
7	Unable	Unequal
8	Different	Uniform
9	Procedural	As we go

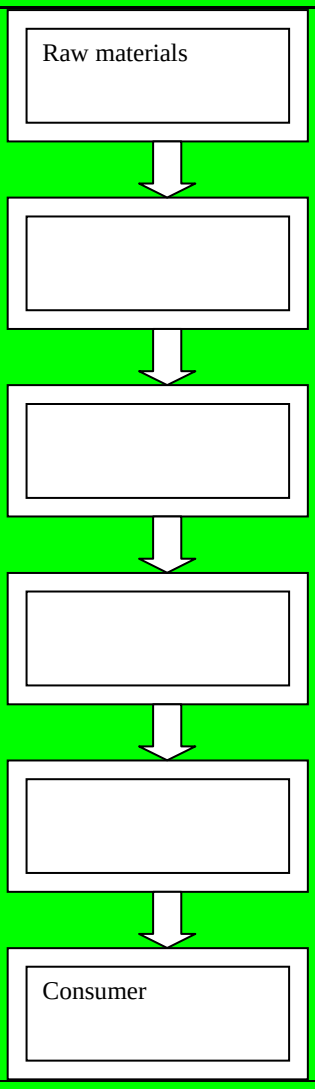
(b)

Presentations: for each question below select which option is best for a good presentation, A or B?

Q#	A	B
1	Expert audience	Inexpert audience
2	Know details, wait for questions	Present all details
3	Read from slides	Talk using flash cards
4	Explain connections between things	Point to an equation for the connections
5	Show a graph	Explain tendencies in the graph
6	Plan on using 100% allotted time	Plans for 100%, 90%, 80% or 70% of allotted time

			7	Large fonts, uniform background	Small fonts, rich background
			8	Only presentation matters	Presentation and presenters are both important
			9	Speaking too loud bothers	Speaking too soft bothers
			10	Clear oral presentation	Clear oral presentation with slides
4	Feb. 3	**5) For each of these three teamwork elements: communication, organization, and participation, discuss if they could be observed during a team presentation you saw today. Include specific examples to support your position** **6) Evaluate how these three teamwork elements: communication, organization, and participation are being performed in your team in Project 0. Is there anything you could do to help the team with respect to these teamwork elements?**			
5	Feb. 8	**7) Describe a least one specific engineering project that were presented today that stood out for you, write a critique on their relevancy to the intended engineering field, referring to specific details presented by that team.** **8) Suppose your team is being asked a question after a presentation, consider this dilemma: a) the need to provide 'an answer' to show the team's confidence and b) the importance of providing correct and accurate information. Explain what option, a) or b) you would be more inclined to and why.**			
6	Feb. 10	**9) What are FE, PE? Why are they important? What is engineering school accreditation? Why is it important?** **10) Mention at least three engineering professional association in their acronyms and full names, and their web address. Why membership in a professional association important for an engineer?**			
7	Feb. 15	**11) Explain at least one difference between your engineering field (as assigned in Project 0) and a related science subject such as Physics (including mechanics, thermodynamics, electricity and magnetism, static, fluids), Chemistry, Biology, Computer Science. Please try to be as specific as you can. Avoid phrases like "engineering science", or "engineering is a branch of physics". Avoid comparisons such as one is generally better than the other, etc. Is there any instance in which an engineering advancement helps discover new science? Explain.** **12) Write your answer to CW2 here.**			
8	Feb. 17	**13) Create a flow chart to show the supply chain of an automobile from the raw materials**			

3)_____ 4)_____ 5)_____ 6) Consumer. In each step, indicate what type of engineers from the table below would be involved. In a few words explain what they do specifically. Can you include all ten fields in the supply chain?



Engineering fields	Abbreviations
Aeronautical and Aerospace Engineering	AAE
Biomedical Engineering	BME
Chemical Engineering	ChE
Civil Engineering	CiE
Computer Engineering	CE
Electrical Engineering	EE
Geological/Geophysical Engineering	GGP
Industrial and Manufacturing Engineering	IME
Material Science Engineering	MSE
Mechanical Engineering	ME

14) Sketch the Engineering Design Cycle in your logbook, explain specific actions to be taken by you and your team for Project 1 as related to the different steps in the cycle. Be as specific and as detailed as possible.

15) Explain in your own words, steps 1-4 on how to prepare an Excel spreadsheet to obtain the model/equation describing a system. In other words, explain what to do in columns A to E in the spreadsheet. Be as detailed as possible.

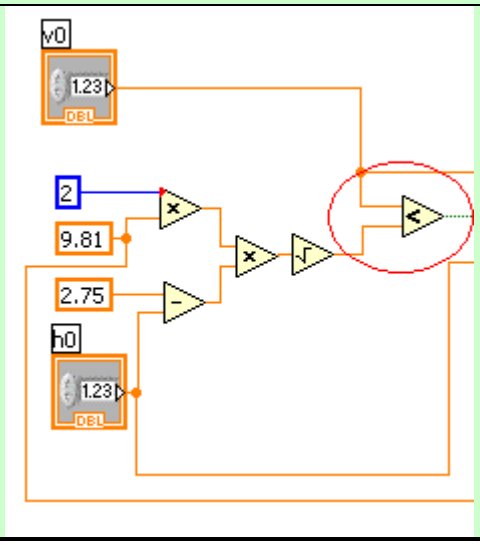
16) Explain why when implementing the quadratic model in cell D3: =$C$3*A3^2+$C$4*A3+$C$5
we used a $ before and after the C, but not for A

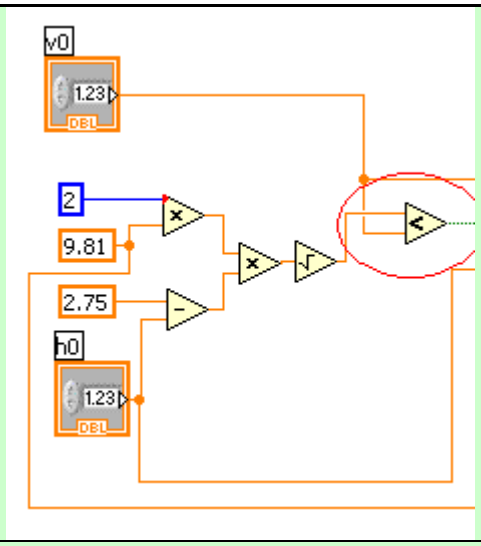
9	Feb. 22	**17) Explain in your own words what did you do in each of the seven steps to do data modeling with Excel in CW3. Write Y'=f(X), being f the quadratic polynomial obtained after using Solver with values for the coefficients a,b,c substituted in. Also write down the final s parameter achieved with these coefficients. Attach a copy of your spreadsheet for CW3.** **18) You have the spreadsheet to make a quadratic model for certain data set, such as the one used in CW3.** **(a) Explain what changes you would do on the spreadsheet to make a linear model for the same data set. Use the most economical way that would not require changing the equations in cells D3 and B9 and copying them into the cells below.** **(b) Explain what changes you would do on the spreadsheet to make a cubic model for the same data set.**
10	Feb. 24	**19) Insert copies of the Tables 1, 2, 3 into your logbook.** **(a) Did you expect to get the same coefficients A, B, C, D and the s parameter for these two sets of data? Notice that the initial four pairs of data are contained in the longer data set. Explain why Tables 1 and 2 contain different results.** **(b) After looking at Tables 2 and 3 can you conclude that for any set of data, the higher the order of the polynomial model (e.g. in this case, the cubic model), the better the model (as reflected in the final s parameter achieved)? Explain why.** **(c) Looking at Tables 2 and 3, which one would be preferred by a scientist, which by an engineer? How would you characterize each table in one word?** **20) Write a quadric (fourth order) polynomial in a similar format as we wrote the cubic polynomial in the previous class note. Explain in your own words what are the changes you will need to do to in the Excel spreadsheet you made for a cubic model to produce a quadric model.**
11	Mar. 1	**21) Insert the three tables shown in CW4 with values of the polynomial coefficients and s parameters in the logbook. Describe the differences in the graphs of the three tables in CW4.** **22) Calculate the constant acceleration of gravity g (in m/s^2) using the quadratic coefficient A from your table #3 of CW4 using the formula provided above; show the calculations and the final result in your logbook**
12	Mar. 3	**25) Sketch the system built by your team, describe the input and output variables on the sketch. What units will you measure these variables, and with what instruments.** **26) Explain with a sketch the different design elements your team used to increase predictability. Explain what mathematical model will be the best to describe the system using the X and Y variables mentioned in the previous question.**
13	Mar. 8	**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.
14	Mar. 10	**23) What is the difference between a Numeric Control and a Numeric Indicator? List examples of each category using the two examples shown above, that is, Circuit Analysis with LabVIEW I and II. What happens if you wire into a Numeric Control?** **24) To implement V/R: should I wire V to the upper left terminal of the Divide operation or to its lower left terminal? Why? How do you save existing numeric values within the Front Panel? (if no extra action is taken next time you open the VI, the Front Panel boxes only show default values of zeros)**
15	Mar. 22	**29) Write in your logbook the equations to obtain I, V2, V4, and V6 from the Circuit Analysis with LabVIEW III. Describe any similar groups of operations that are repeating in these equations.** **30) Insert a copy of your Block Diagram for Circuit Analysis with LabVIEW III, circle the similar groups of operations you mentioned in the previous question. These groups of repeating operations will be replaced by a sub-VI in Circuit Analysis with LabVIEW IV. Answer this question when your VI for Circuit Analysis with LabVIEW III is completed.**
16	Mar. 24	**31) How many sub-VI's did you create in this exercise? What is the difference between creating a VI and creating a sub-VI?** **32) How do you call in a sub-VI? How do you wire it? What would happen if you did not properly assign connectors when creating the sub-VI?**
17	Mar. 29	**33) Specify the inputs and outputs, with clear details, for your team Virtual Instrument to be presented as Part I of Project 2. Write the equations that allow the calculation of the outputs from the inputs, explain each variable in your equations.** **34) Insert a snapshot of the Front Panel (FP) and Block Diagram (BD) of your team's VI for Part I of Project 2, explain why did you use those specific LabVIEW elements in the FP and BD.**
18	Mar. 31	**35) LabVIEW: in this Classwork what formula did we try to implement multiple times using the For Loop?, In a For Loop what do the 'N' and 'i' stand for? Once we have the time series (horizontal axis in the Waveform graph), how did we calculate values of the function f for each element of the time series to get f(ti) (vertical axis in the Waveform graph)?** **36) Why do we need a 'Bundle' for the Waveform graph? How many inputs should the 'Bundle' have and what should be connected to those inputs?**
19	Apr. 5	**37) Describe at least two LabVIEW elements not included in your team's VI but used in other teams' VI's.** **38) Specify the inputs and outputs, with clear details including equations to obtain the outputs from the inputs, for your team Virtual Instrument to be presented as Part II of Project 2. List what LabVIEW elements will be used in the Block Diagram, how many times a subVI will be called in, and what elements will be included in the sub-VI, use LabVIEW terminology.**
20	Apr. 7	**39) Explain any similarity between a sub-VI and a "super-operator". What are the**

<table>
<tr><td></td><td></td><td>advantages and disadvantages of using a “super-operator” a)in computer programming b) in mathematics

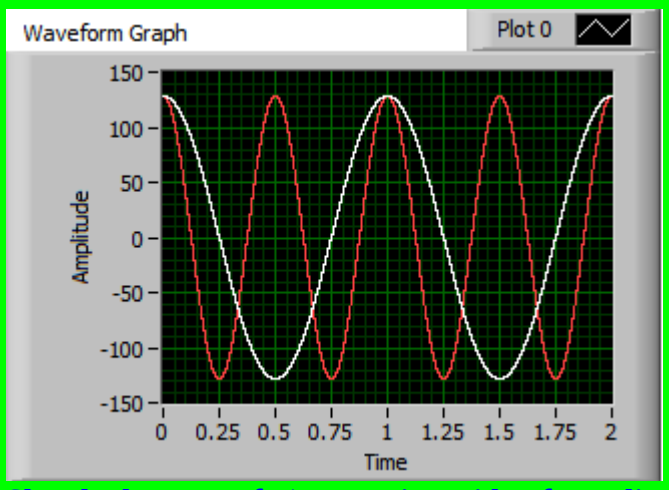
40) Insert a snapshot of the Front Panel and Block Diagram of your team VI for Part II of Project 2, explain why the different elements were used. Also do the same for any sub-VI created and used in Part II.</td></tr>
<tr><td>21</td><td>Apr. 12</td><td>41) In the LabVIEW exercise we completed in CW9, the result of what operation decides which window (True or False) of the Case Structure will be used? How do you call a variable that can take only two possible values (for example: 1 or 0; or True or False)?

42) Include a print-out of your Block Diagram for CW9. Answer questions a) and b) for two possible connections at the less-than operator shown in the table below:
<table>
<tr><th>If v_0 and its limit are connected to the less-than comparison as shown below</th><th>a) Within the True window of the Case Structure, what do you write inside the String Constant?</th><th>b) Within the False window of the Case Structure, what do you write inside the String Constant?</th></tr>
<tr><td> 
</td><td></td><td></td></tr>
</table></td></tr>
</table>



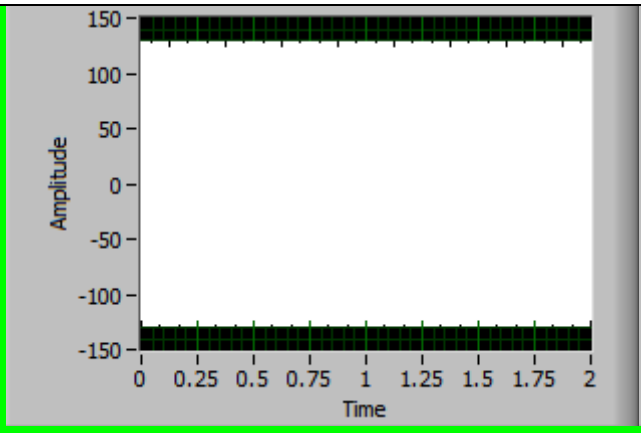
22 Apr. 14

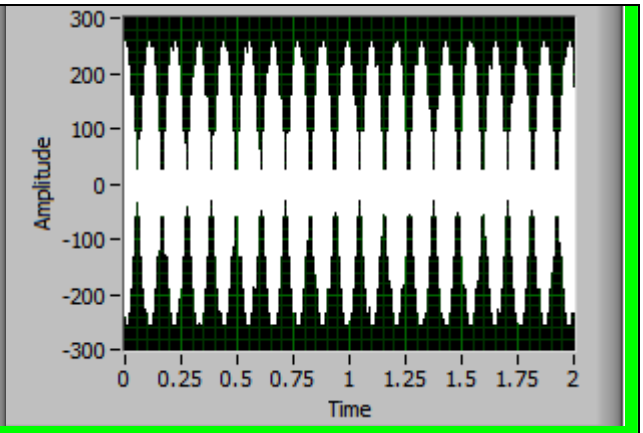
43) What are the amplitude, period T, and linear frequency f=1/T for the two sinusoid (white and red) in the figure below.



Sketch the sum of a) Two sinusoids of amplitude 10, and linear frequency 2 Hz b) Two sinusoids, one of linear frequency 1Hz, the other of linear frequency 2 Hz, both of amplitude 10.

44) If both figures below show the sum of two sinusoids, which one represent audible beats, and what are the conditions on the amplitudes and frequencies of the combining sinusoids for this to happen?





23 Apr. 19

45) How many peaks do you see in the spectrum (as produced by the FFT.vi and Abs) for a signal that is composed of two sinusoids of different frequencies? What happens to the spectrum if you leave the frequency of sinusoid #1 fixed while increasing the frequency of sinusoid #2. What would you see in the spectrum of a signal that is composed of 5 sinusoids of different frequencies?

46) In our LabVIEW exercise we used a sinusoid of amplitude 128; then we added 127 to the Y series before converting it to a digital signal using U8 (To Unsigned Byte Integer). Is there any connection between 128; 127; and the 8 in "U8"? Explain. Fill out the table below

# binary digits	Largest decimal number
4	15
8	
12	
16	
32	
64	

24 Apr. 21

47) a) Binary numbers: write 0.625 and 0.875 using 8 bit binary numbers with a "binary dot" between the two groups of four bits. b) Can you write 0.626 using 8 bits with four bits after the dot? Explain if we could achieve exact calculations using a digital computer. Can you offer a solution?

48) What are the information required by an XY Graph? What did we use the 'Build Array' for? Specify the LabVIEW version you are using and describe how to insert an "Array" of 'Numeric Controls" in the Front Panel. Also where to find the 'Gaussian Peak Fit.vi' and what inputs and outputs we are using in this exercise.

49) Explain why did we use a Gaussian Peak Fit to model the data stored in numeric arrays X and Y (with noise), instead of choosing Linear Fit, or Polynomial Fit.

50) What was the Signal Amplitude as specified in the Block Diagram above? Explain what happens to the Recovered Amplitudes, Mean, and Standard Deviation when the Noise Amplitude is decreased from 20% of the Signal Amplitude down to 1%?

25 Apr. 26

49) Explain why did we use a Gaussian Peak Fit to model the data stored in numeric

		arrays X and Y (with noise), instead of choosing Linear Fit, or Polynomial Fit. **50) What was the Signal Amplitude as specified in the Block Diagram above? Explain what happens to the Recovered Amplitudes, Mean, and Standard Deviation when the Noise Amplitude is decreased from 20% of the Signal Amplitude down to 1%?**
26	Apr. 28	**51) In the Block Diagram shown above which produces the prediction Y' for an input X using a polynomial model, what are the roles of the Formula Node and the For Loop. And what order is being used here for the polynomial model, how can you tell? Is it possible to make this order a variable to be specified by the user?** **52) In the same Block Diagram, explain how you obtain the coefficients 'c' via the 'Array' if you were doing Topic A or B in Project 3.**
27	May 3	**53) Describe two other projects (presented by other teams), include information about their Front Panel and Block Diagram (what elements did they use and why)** **54) Describe the modifications required for your team Virtual Instrument. Explain how this was done: what LabVIEW elements have been added in the Front Panel and Block Diagram, name those elements as they are called in LabVIEW, include a diagram of their inputs and output connections, and explain how were these elements connected to the rest of the Block Diagram.**
28	May 5	
29	May 10	
	Check WISER	**Location: S-3-126** **Logbook is required to take the final**