Engin 103
Logbook Questions
Fall '09

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.

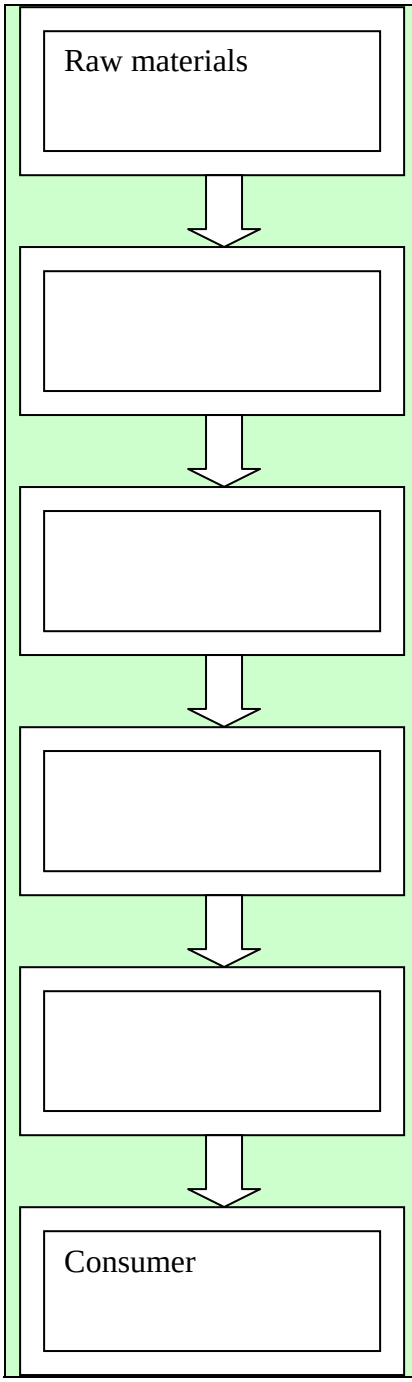
-Use a quadrille notebook; number all pages; date all entries
-Write your notes for all activities, thoughts, problems and solutions, and learning conclusions related to Engin 103. You should write down progress, outcomes, and conclusions on projects and teamwork; conclusions from class work (including 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 two questions in each note thereafter.

Logbook	Due
Questions 1-20	October 13, 2009
Questions 21-32	November 5, 2009
Questions 33-50	December 1, 2009
Questions 1-56	Final Exam

Class	Date Class notes	Logbook Questions
1	Sept. 8	
2	Sept. 10	**1) 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)?** **2) 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.**
3	Sept. 15	**3) 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.**

		4) 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	Sept. 17	**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	Sept. 22	**7) Describe a least one specific engineering projects 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	Sept. 24	**9) After watching the presentations on Project 0 –Part II, what would be a presentation technique that will most likely produce more questions from the audience?** **10) Write a summary of what you have learned from CW1 (see above)** **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) Create a flow chart to show the supply chain of an automobile from the raw materials to the end consumer. The chain should include at least 6 steps: 1) Raw materials 2)_____ 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?**



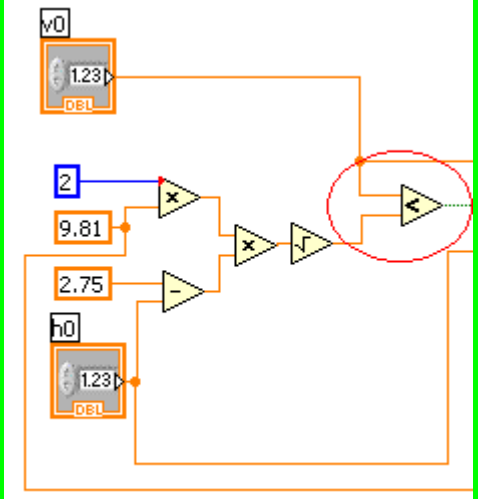
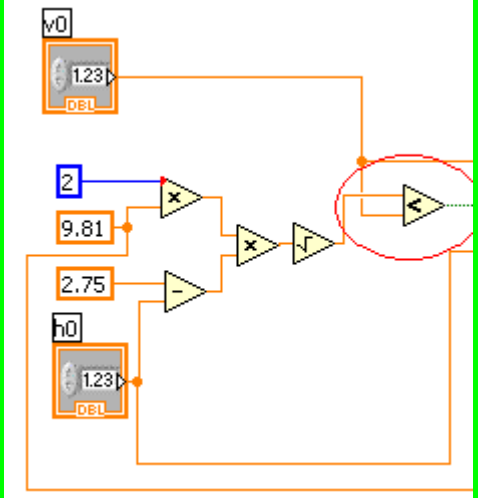
Engineering fields	Abbreviations
Aeronautical and Aerospace Engineering	**AAE**
Biomedical Engineering	**BME**
Chemical Engineering	**ChE**
Civil Engineering	**CiE**
Computer Engineering	**CE**
Electrical Engineering	**EE**
Geological/Geophysical Engineering	**GGP**
Industrial and Manufacturing Engineering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

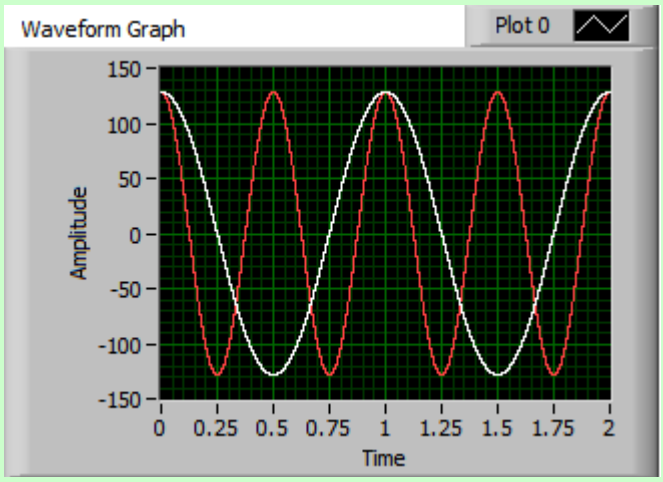
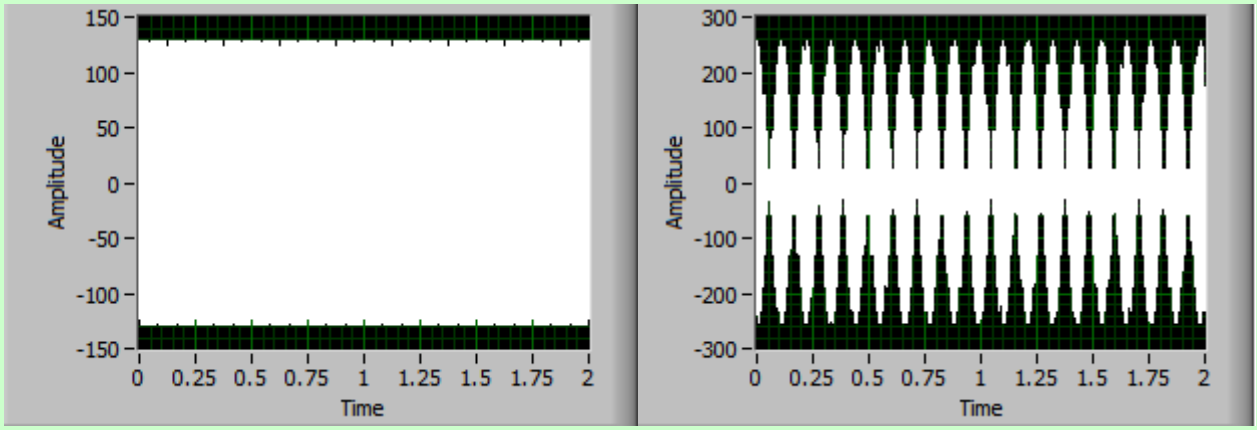
This table is related to question #12

7	Sept. 29	**13) Explain in your own words at least two main differences between science and engineering, for the field you worked with in Project 0.** **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**
8	Oct. 1	**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.**
9	Oct. 6	**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.** **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.**
10	Oct. 8	**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**
11	Oct. 13	**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)
12	Oct. 15	**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	Oct. 20	**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	Oct. 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.**
15	Oct. 27	**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?**
16	Oct. 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 and Block Diagram of your team VI for Part I of Project 2, explain did you need to use those specific elements.**
17	Nov. 3	**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?**
18	Nov. 5	**37) In the LabVIEW exercise we completed today (CW10), 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)?** **38) Include a print-out of your Block Diagram for CW10. Answer questions a) and b) for two possible connections at the less-than operator shown in the table below:**

		If v_0 and its limit are connected to the less-than comparison as shown below	**a) Within the True window of the Case Structure, what do you write inside the String Constant?**	**b) Within the False window of the Case Structure, what do you write inside the String Constant?**
				
				
19	Nov. 10	**39) Describe at least two LabVIEW elements not included in your team's VI but used in other teams' VI's.** **40) 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	Nov. 12	**41) Explain any similarity between a sub-VI and a "super-operator". What are the advantages and disadvantages of using a "super-operator" a)in computer programming b) in mathematics** **42) 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.**
21	Nov. 17	**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 sinousoids, 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?** 
22	Nov. 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**

<table>
<tr><td></td><td></td><td>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
<table>
<tr><th># binary digits</th><th>Largest decimal number</th></tr>
<tr><td>4</td><td>15</td></tr>
<tr><td>8</td><td></td></tr>
<tr><td>12</td><td></td></tr>
<tr><td>16</td><td></td></tr>
<tr><td>32</td><td></td></tr>
<tr><td>64</td><td></td></tr>
</table></td></tr>
<tr><td>23</td><td>Nov. 24</td><td>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%?</td></tr>
<tr><td>24</td><td>Dec. 1</td><td>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 the polynomial model, how can you tell?

52) In the same Block Diagram, explain how do you obtain the coefficients ‘c’ via the ‘Array’ if you were doing the Topic A or B in Project 3.</td></tr>
<tr><td>25</td><td>Dec. 3</td><td>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 can be done.</td></tr>
<tr><td>26</td><td>Dec. 8</td><td>55) Describe the modifications required for your team Virtual Instrument. Explain how did your team implemented the modifications: 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 are these connected to the rest of the Block Diagram.</td></tr>
</table>

		56) Explain the modifications implemented by those two teams whose Project 3's you described in your answer to question #53, include what LabVIEW elements did they add in their Front Panel and Block Diagrams to achieve their goals.
27	Dec. 10	**None**
	Final Exam in S-3-126	**Section 1: December 17, 2009 8:00-11:00AM S-3-126 Logbook is required** **Section 2: December 22, 2009 3:00-6:00 PM S-3-126 Logbook is required**