

Engineering Notebook Guidelines

You will need to acquire an engineering notebook for the lab. The following guideline how to use the notebook would be still very helpful. In our lab, TAs mainly check the important data, findings, and thoughts in the note session during the lab. This guide was compiled by Dr. Ed Yu at UT Austin.

Guideline for Engineering Notebook

Learning to keep an engineering notebook is an essential skill that you will use throughout your educational experience at UTA. Each student is encouraged to keep an engineering notebook, which chronicles his or her work in the labs. All information, which may be pertinent to the project or labs, should be written here. You will use your notebook to record your measurements and other data for the EE labs. Here are some guidelines taken largely from work done by Clif Kussmaul when he was an assistant professor at Moravian College. He is currently an assistant Professor of Computer Science at Muhlenberg College.

Engineering notebooks are used in industry to record **what work was done** (in case the author leaves the project or company) and **when work was done** (for patent and copyright matters). Ultimately, your engineering notebook should allow another knowledgeable student to be able to exactly repeat the work you have performed. Here are some basic guidelines you need to follow:

- The notebook must be **permanently bound** (glued or sewn). The bookstore has several styles from which to choose. **Spiral bound or loose-leaf notebooks are not acceptable.**
- The notebook must be **clearly labeled** with your name and the semester.
- Everything must be written in **permanent ink** (it may be useful to have several color pens). Every page must be **numbered consecutively**, in part to prove that you have not added or removed pages after the fact.
- Leave several pages at the beginning for a **table of contents** so you can locate key information quickly.
- Start a new page each day you work on this course, and at the top of the page **clearly indicate the date and hours you worked.**
- When you finish work for the day, draw a line through any space left on the page.
- Do not leave any blank pages.
- Describe **all work you do for the course**, including readings, research, design, coding, documentation, test, team meetings, class meetings, etc. Include sketches, memos, relevant code listings, etc. You should glue them into the notebook.
- The notebook is meant to be a **permanent record of what you have done**. It must be neat enough for you or someone else to understand what you have done a year or more later. Do not work on other paper and then transcribe it into your notebook!
- Your notebook should be kept up-to-date at all times and brought to EVERY lab session. An example of what would go into an engineering notebook based upon this lab is as shown below:
- Laboratory data such as measured currents, voltages, resistances and the procedures you may have used to measure these quantities.

Appendix: Keeping an Engineering Notebook

An engineering notebook is a chronological record used in industry to document the work done on a project and when. It is a legal document. Industry is a competitive environment, and vying for patents, copyrights, and even people (i.e. recruitment of engineers) is not uncommon. So, precautionary measures need to be taken to protect the interests of all the parties involved. Therefore, what might seem as a rigid structure for engineering notebooks, actually allows for the recognition of work done, retention of intellectual property, and continuity of a project should an engineer leave the workplace. **Below are the guidelines you should follow for your notebook in EE1205. You will be using your notebook to document the work you do for your team project or the other EE labs. In addition, you should also record any work pertaining to the lab or thinking that you do outside of lab, such as meeting minutes for the team project, pre-lab questions, etc. Remember that a properly documented notebook is one where you or someone else can look back at your work years later and reproduce what you did exactly.**

- 1. Your engineering notebook must have a permanent binding.**
- 2. Always write in pen.** Engineering notebooks are meant to be permanent records of your work. Pencil is unacceptable because entries in pencil can be easily changed.
- 3. Print and sign your name, and write EE 1205, on your lab notebook cover** to distinguish your notebook from others and establish your “identity” by way of your signature.
- 4. Decide whether you are going to write on only one side of the page, or both front and back, and abide by your convention.** If you have been following one convention and arbitrarily switch, this casts doubt as to whether the work on the pages in question is your own. If you would like to patent something from your notebook, you would like to give undeniable evidence that you arrived at the findings and that your notebook was not tampered with in any way.
- 5. If you leave a page blank for any reason, you must write, “This page left intentionally blank” in large lettering across the page, print your name, sign, and date this comment on the page.** For front-side-only writers, this means skipping the front page, whereas for the other convention, it means skipping any page. This rule keeps everyone honest about retroactively writing in discoveries that were not actually found in that chronological order (important for patent matters). This also keeps someone else from writing in your notebook and passing off some of your work as their own.
- 6. If your notebook is not already numbered, you must number each page.** You will be maintaining a table of contents to be able to refer to the point in your notebook where you documented a specific item. Without numbered pages, you wind up using relative locations like “prior to table 5.8, but after Lab 4, about midway through the notebook”. Good luck finding any item quickly!
- 7. Set aside the first 2-3 pages for a Table of Contents. Write “Table of Contents” above the first line and underline it. The table of contents should contain four columns of information: Serial Number, Title (name or description are acceptable headings, too), Date, and Page Number.**

Examples of entries would be as follows:

Serial Number	Title	Date	Page Number
Lab 1	Circuits Lab I	9/02/11	4
Lab 2	Circuits Lab II	9/9/11	5
Lab 3	Circuits Lab III	9/16/11	6
Lab 4.1	Breadboard and Measurements Prelab	9/23/11	8
Lab 4.2	Equipment	9/24/11	12
Lab 4.3	Breadboard and Measurements Lab Report	9/24/11	13
Meeting 9	Algorithm Brainstorm	10/14/11	18

In industry, you will document numerous entries, and have multiple volumes of engineering notebooks (i.e. when you reach the last page of your first notebook, you label it volume 1, get a new one and start volume 2, etc.) over the span of a project's lifetime, which could be several years or even decades. Also, experiments or "labs" in industry, are much longer than the two-hours allotted for EE1205 Lab. You may have multiple experiments running simultaneously so your serial entries may not be sequential for a particular experiment in your notebook. If you had to refresh your memory on something you wrote four years ago relating to a specific result of a five-week experiment, spanning one hundred pages with three other experiments intermingled in that time frame (after narrowing the experiment down to volume 2 of 7), this could be a painful search if you did not subdivide your experiment carefully in your table of contents and notebook.

8. Figures and Tables should always be numbered, titled, and entered into your Table of Contents or a separate "List of Figures and Tables" immediately following your table of contents. The reasoning is that any data or information that you deemed important enough to have grouped into a table, plotted on a graph, or illustrated on a diagram or sketch is important enough to be indexed. Figures or tables often indicate important results or conclusions, which should be documented for easy reference in your table of contents.

9. When you paste any pages into your notebook:

- **Do so with rubber cement or a glue stick**, so that it is not easy to rip out the pages for the reasons presented in step zero above. Many other adhesives such as tape or Elmer's glue are too messy or unreliable as a "permanent" adhesive.
- **Sign and date what you paste into your notebook with a portion of the signature and date on the page you are inserting and the remaining portion of your signature and date spilling onto the page of your notebook that you are pasting the item into.** The reasoning here is just like signing the back of an envelope that includes an official, confidential document – if the signature is broken, you know the item was tampered with or is missing from your notebook.
- **Always include any pasted items into your table of contents or list of figures and tables.** This is done as a further precaution to ensure that the inserted information is documented as part of the permanent pages of the notebook so that, should something fall out, you can re-glue it where it belongs, or should it be removed, you can prove what was removed.

10. It is important to be as neat and thorough as possible when writing in your engineering notebook. Reproducibility of results is extremely important in science, when proving-out new findings. If the author of a notebook cannot understand what they wrote in order to recreate their experiment, how is someone else supposed to?

11. Print your name, sign, and date EVERY page in your notebook when you enter information on that page. It is common to do this in the upper right or lower right corner of the page, and you should be consistent with whatever convention you choose once again. Although a tedious task, this proves UNDENIABLY that YOU are writing in your notebook on THAT particular date and consequently, that the work done on that page is YOURS. If you can claim your work, then you can claim credit for your ideas and prove you did the work first, should you have patent, copyright, or Nobel Prize-winning thoughts. Simultaneity of inventions is a very common occurrence in science, and the glory sometimes goes to the person who recorded their ideas a day earlier.

12. Comments on dates: You are going to be writing dates in your notebook constantly. These dates refer to when you are writing in your notebook, not when you did what you are writing about! Remember, your notebook is a chronological record and time starts when you put your pen to the paper.

- a. In the table of contents, write the date you entered your actual work into your notebook, not the date you performed your work or the date you happen to be updating your table of contents.

- b. When you sign and date your notebook, you again write the date you are entering information on that page, not the date you arrived at that information.
- c. When you paste something into your notebook and sign the pasted item, you once again write the date you are pasting this item into your notebook.
- d. In reality, your notebook will be constantly maintained, so usually you are entering information into your notebook as you are performing the functions you are writing about, and the dates concur. However, if this is not the case, such as for your labs 1 and 2, and you are concerned about documenting when you did the labs, you may choose to put a note at the beginning of your lab write-up stating that the lab was actually performed on X date in the past. In general, this is a good practice, but your TA will not enforce it heavily.
- e. If you want to add a comment on, or a reference to, a recent development of one of your past experiments in the margin of the pertinent page of your original experiment, this is perfectly acceptable, as long as you write "Comment in margin/below was added on:", write the current date, and sign it.

13. The serial number and title written in your table of contents should match EXACTLY to what you write on the referenced page in your notebook on the first line of the page and be underlined. The date of your signature, figure, and table numbers and titles should also match the table of contents. There is obviously no use in having a table of contents if it does not accurately represent or refer to what is in those pages of your notebook.

14. If there is a significant amount of blank space left on a page that you were writing on (about 1/8 or more), you should cross-out the remaining space or draw a vertical line through it to demonstrate that no further information will be written on that page. An alternative is to draw a horizontal line across the page and begin the next entry directly beneath it. In this case, you must make sure to print your name, sign, and date both portions of the page. Remember that the dates will be different, if the second entry is not being entered on the same date as the previous one. So your page looks like:

Blah, blah, blah	Lab 1: Part I	Name, signature, Date
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Yaddi, yadda, yah

15. Making mistakes while writing in pen often concerns students. However, you are bound to make mistakes, which you will cross-out by drawing a line through the item ONCE or TWICE. You should still be able to read your crossed-out information. **DO NOT BLACK OUT MISTAKES NO MATTER HOW SURE YOU ARE OF YOUR ERROR.** Assume that you arrive at some results after performing a two-week experiment and the data just does not seem to be correct. So you black-out your experiment, since it appears wrong, and pursue a different method for your experiment. A month later, after you have finished your experiment by means of method two, you realize your logic was completely faulty in arriving at your results for method two. You remember that you had done a prior method, which now seems to be correct. So you excitedly turn to method one in your notebook to try to find your data and procedure because you no longer remember the details, only to find blackness. There is a chance you might be able to reproduce your discovery if you think back hard enough, but you still have to do another two-weeks worth of work again. However, if you cannot remember what you did, you are condemned to starting over. The important fact is that you realized your error, corrected it, and left it there for posterity in case you need to refer to lessons learned during your experiment. In summary, don't black out what appear to be errors. Leave them legible in case the errors turn out to be correct.

16. You should NEVER tear pages out of your notebook. If your notebook was meant to have pages torn out, step one on keeping a permanently bound notebook would not exist. If your notebook IS permanently bound and missing pages, this casts doubt as to what was on those pages and why they were thrown away. Is there missing information to your experiment? Are you hiding a key discovery from your employer to keep the glory and money to yourself even though you and your thoughts are considered their intellectual property? Are you sabotaging your project because you are a disgruntled employee? The bottom line: missing pages bring up questions and speculation, which diminishes your credibility as an engineer and/or employee. If for some reason you already tore out pages of your notebook, you should write on one of the adjacent pages where the discontinuity in your notebook occurs that "X number of pages were intentionally torn out of this notebook because...", print your name, sign, and date this comment, and get a TA to sign and date the comment.

17. It is common practice with engineering notebooks for someone other than yourself, such as your manager or a colleague in the lab, to validate your work by writing "Read and Understood by:" or "Witnessed by:", printing their name, signing, and dating your notebook everywhere you have items pasted into your notebook (similar rules on how to do this apply to them), and at the end of each major section of your experiment. This serves as a sanity checkpoint, where they might point out gross errors, in the spirit of collaboration, so that you do not get too far without realizing your logic, measurements, or calculations are wrong and you need to start over or make corrections. TA's will be enforcing this loosely in the sense that they will initial and date those sections of your notebook due to time constraints with the number of students in lab.

18. General format to be used in your notebook for the EE labs:

Series Number and Title (underlined)

Prelab - Answer the questions in complete sentences.

Partners or Collaborators (if any) - Give credit where it is due if you did not work on something alone.

Objective - What are your goals for the lab? This section should be concise and to the point

Introduction – Any background information that you think is necessary prior to proceeding with the experiment. If you cannot think of any information that is not redundant to the objective, skip this section, but sometimes you will want to expound on the EE principles that you are going to investigate in lab or how you are going to approach the solution to a problem.

Equipment – Write down all equipment used (make, model, and serial numbers if applicable). If the results to your experiment go awry, you want to be able to “root-cause”, that is, find out what went wrong. If you had a broken instrument, you can track that instrument down with its serial number and attribute the problem to it. If there is nothing wrong with the instruments you used, then you have at least narrowed your problem down to the experimental setup, your procedure, or post-processing of data. So, if you have wrong current values for lab 4, you would ideally be able to check Manufacturer Z’s Digital Multimeter 2Xa with serial number 53590352 and realize that it had a blown fuse. In industry, you may work with prototypes to verify correct functionality of a product before it launches on the market. It is not uncommon to find an issue specific to a particular prototype because the manufacturing process and design of the product will not be solidified yet. If you are testing a new chip for production along with 50 other engineers, and you pick up a chip one day that is the only one exhibiting a problem, your defect may be prototype-specific, and it may be a defect that only occurs on 1 in a million chips. So if you want to have any hopes of understanding and fixing the problem, you better make sure you know which chip out of the 2000 prototypes that were built in that manufacturing cycle had the problem. Often, prototype-specific problems are found only after you have conducted your experiments, analyzed your results, and compared notes with your colleagues only to find that they did not see this problem (and you will not always have the luxury of testing with the same prototype)!

Procedure – This should include any diagrams, calculations (Note: You need to show your work), measurements, answers to any questions in the lab handout in complete sentences, and a description of what you are doing/did, why, and how you are doing/did it, unless it is obvious. For a lab for instance, if you did not know how to measure current prior to the lab, then somewhere in your notebook, it would make sense to have a schematic and description of how you measured it and even a description of how NOT to measure it and why.

Lab Report – This section sums up any results you arrived at during the experiment and how you know your results are correct (e.g. the theoretical values of the resistors matched the measured values). If your results are not correct and you have realized this, then you write down why they are not and what you did wrong. Make sure to answer any conclusion questions from the lab handout in this section. You should also include lessons learned about your experiment. For example, if you want to write that the colors Red and Brown on resistors look similar and you should be careful not to get them confused because you accidentally calculated the value of a resistor incorrectly in lab this way and had to correct it later, this is acceptable material for a conclusion, too.

19. General format to be used in your notebook for the Labs:

Series Number and Title (underlined)

Objective - What are your goals for the lab?

Procedure – Should include:

- a. **Program**

- b. **Explanation of the program** (functional diagram, algorithm, comments of functions included in the program)
- c. **A brief description of what you are doing/did, why, and how**

Data Analysis/Conclusion – Sums up any results you arrived at during lab. Include lessons learned, any difficulties you encountered and how you resolved them. If applicable, any design improvements you might make in the future.

Engineering Notebook Checklist for 10% credit

Checklist Item	Complete?
1. Does your notebook have permanent binding?	
2. Have you written everything in pen?	
3. Have you printed AND signed your name AND written EE125 on your lab notebook cover?	
4. Is every written page in your notebook numbered?	
5. Did you set aside the first 2-3 pages for a Table of Contents and/or List of Figures and Tables?	
6. Did you write "Table of Contents" in the first page and line of your notebook and underline it?	
7. Does your Table of Contents contain four column headings (Serial Number, Title, Date, and Page Number)?	
8. Have you CONSISTENTLY written on only the front page OR front and back depending on the notebook convention you elected?	
9. If you left any pages blank (that violate your notebook convention), did you write "This page left intentionally blank" in large lettering across the page AND printed AND signed your name AND written the date?	
10. If you left any blank space on a page, did you cross-out or draw a vertical line through the remaining space?	
11. Have you numbered and titled all figures, pasted items, and/or tables in your lab write-up AND entered them into your Table of Contents or List of Figures and Tables (if appropriate) AND made sure they match word for word?	
12. Have you written the serial number and title of the lab on the first line of your lab write-up AND underlined it AND entered it into the Table of Contents AND made sure they match word-for-word?	
13. If you pasted any items into your notebook, did you use rubber cement and/or a glue stick AND signed your name AND dated the item such that your signature and date begin on the pasted item and spill onto the page of your notebook you pasted the item into?	
14. Have you printed AND signed your name AND dated EVERY page that you have used in your notebook (save the Table of Contents or List of Figures and Tables, if appropriate)?	
15. Do all the dates in your notebook reflect the date you ENTERED the information into your notebook, rather than the date you arrived at the information/performed the experiment you are writing about?	
16. Have you entered all the dates and page numbers into your Table of Contents or List of Figures and Tables accurately to match those pages of your notebook?	
17. If you chose to write multiple experiments or entries into your notebook on the same page, have you drawn a horizontal line to divide these entries AND signed AND printed your name AND dated each section AND written the new series number and title and underlined it AND entered it into your Table of Contents, making sure to match everything word for word?	
18. If you have made any mistakes in your write-up, did you cross them out by drawing ONE or TWO lines only so that they are still legible scratch-outs?	
19. If you have torn pages out of your notebook, have you written on the next available page why those pages were torn out, what they contained, and signed and dated this comment?	
20. Have you written legibly enough so that someone else can read your notebook?	