Engineering Notebook Guidelines

ECE214: Electrical Circuits Laboratory

An engineering, or laboratory, notebook serves several functions. In industry it serves as a legal document to establish priority of invention in patent disputes. While we do not expect many patentable discoveries to come out of the ECE 214 labs, you should develop good notebook habits. It will serve you well when you go to work for a company that has such expectations. In scientific research, an Engineering Notebook provides a record that allows you to duplicate your work if you succeed at your endeavor (or if you achieve some unexpected but significant result). It's also useful in identifying what might have gone wrong if you achieve neither your desired result nor a miraculous discovery.

You will also collect and generate a number of pages of printed material that are related to the lab work. These will include lab handouts, data sheets, and Computer Simulation and MatLab printouts to name a few. These handouts can be kept in a separate 3-ring binder that you bring to lab or taped into your Engineering Notebook. Copies of all important results and conclusions should be included in your Engineering Notebook.

Since we will not have weekly lab reports, your Engineering Notebook provides a mechanism for evaluating your performance. Furthermore, you will need your Engineering Notebook during exams. Some exam questions will require information gathered during lab sessions. Engineering Notebooks will be collected with the preliminary exams and graded.

The Book Itself

Every student will keep a single engineering notebook. The notebook must be a bound book with consecutively numbered pages. Do not tear pages out of your notebook. Do not tear any page of the notebook. Composition books having quadrille ruled sheets make good lab notebooks; they allow tables, graphs, and circuit diagrams to be laid out neatly. Notebooks with duplicate pages and carbon paper are impressive, but messy and not really necessary. Spiral notebooks without pre-numbered pages, loose leaf binders and electronic notebooks are not acceptable.

Format

- Reserve the first few pages for a table of contents. Each time you use your notebook (pre-lab calculations, during lab, or post-lab summary) draw a line, write the date, title of the new section, lab number and name of your team member (if working as part of a team), and make an entry in the table of contents along with the date.
- Date each page. Each page should have at least one date. All pages should be dated consecutively.
- Do not skip any pages or leave blank spaces in a page.
- Always use ink (not pencil). If you make a mistake, draw a single line through it, leaving it legible. Some of the greatest advances in modern technology began life as mistakes. Use all pages consecutively; leave no blank pages and do not remove pages.
- All entries should be made by hand except for computer printouts of schematic diagrams or computer printouts of plots. No text printouts should be attached to your notebook. All printouts should be trimmed to fit one page of the notebook, and should be glued or taped into the book. Do not use staples.

Contents

Your notebook will contain a record of each of the phases of your weekly lab. The notebook should be limited to work related to the ECE 214 labs. Do not include notes from the classroom unless they directly apply to the assigned lab. Here are a few guidelines:

Before the Lab

Before you come to lab, you should have a plan for what you are going to do. As you formulate this plan, put any calculations, designs, ideas, questions, etc. in your notebook. The lab handout will often include a Pre-Lab work section. This work should be done before you come to lab. It may require calculations or graphs that must be added to your lab notebook or the assembly of a circuit.

During the Lab

1. The notebook should contain a written description of each laboratory procedure. The description should be sufficient so that a reader given the lab handout could follow the work done and identify the results requested in the handout. The Lab procedures are numbered in the handouts. Make sure you indicate in your notebook how the notebook entries correspond to the procedure steps.

2. Describe the experimental setup completely but succinctly. Include the equipment and model numbers but do not include equipment serial numbers.

3. Include a complete diagram for each circuit you design or construct. Label the values of each component, including units if there might be a question.

4. Indicate clearly the points in the circuit where voltage or current measurements were taken.

5. All data should be recorded directly in to the notebook at the time it is taken. Never write data on scrap paper. Every time you copy data there's a possibility of transcription error.

6. Multiple or sequential measurements should be recorded in a table. Table headings should include the name of the variable and the units. The table should also have a title and description of what it is; make sure to include the procedure step and number from the class handout.

7. You may be asked to draw a waveform as seen on the oscilloscope or to plot measured data points from a table. These drawings should be done by hand during the lab session.

8. Label each axis of a graph, including units, and give each graph a title and description of what it is; make sure to include the procedure step and number from the class handout.

9. If something does not work or behaves unexpectedly, make a note of it. When you fix something, describe what was wrong and how you fixed it.

10. The lab handouts will contain a procedure section describing what you should do in lab. You may, for example, be asked to take certain measurements or to describe the behavior of a circuit. Make sure that you do all the procedures and answer all the questions. It should be easy to find the results in your notebook and associate them with the procedure step and number.

After the lab

After most labs you will answer a series of questions and perform tasks described on the Work Sheet. You will use the data generated during the lab and recorded in your notebook to complete the work sheet. This is another reason to develop good habits with your notebook. All of the information needed to complete the work sheet should be added to your Engineering Notebook.

Basic Presentation Guidelines

These guidelines will set down some basic tips that will help you present your work in the best possible way. The way you present your work is important in your academic life as well as your future career as an engineer. Good presentation will:

- Help you clearly demonstrate your understanding of the material to those who will review it
- Train you to use the correct format and concise wording when you create your work
- Emphasize the importance of the process used to obtain an answer
- Make it easier to revise and correct what you have done.

Use the following list of tips whenever you create work to be handed in for this class. Another way to think about what is expected of you is to consider the question: Would the class understand your work if it was photocopied and distributed but not given any accompanying verbal explanation? If the class would find your work difficult to follow, then your work is unacceptable.

1. Identify the answer to each problem by drawing a box or circle around it.
2. If the steps required to solve a problem are not clear from the layout of the problem, identify in writing what steps you have used.
3. Draw schematics for all circuits under consideration, and redraw them when the circuit is collapsed, expanded, or modified. Do not draw circuits on top of other circuits.
4. If you define a new variable (e.g. V0, R1) be sure to identify it on your drawing.
5. Define all variables in a circuit and use consistent notation. For example, Va is not equal to va nor is it equal to VA.
6. Equations should have an expression on both sides of the equal sign.
7. Voltages are usually defined by a value and two measurement points (nodes) labeled with a "+" and "–" respectively. If a voltage at a single point (node) in a circuit is defined, it will be assumed that the second node is the ground node (zero volts) of the circuit.
8. Currents are defined by a value and a direction in a circuit branch.
9. Use the notation "||" to denote components added in parallel. For example: $40\Omega \parallel 10\Omega = 8\Omega$.
10. Cross out things you do not want considered toward your grade.

11. Your work should proceed left-to-right and top-to-bottom. If you must alter this scheme, use arrows to indicate the flow.

12. Use at least four significant digits for preliminary results on a problem. Doing so will guarantee that the final result is accurate to three significant digits.

13. Express your final answer in three significant digits using scientific notation. For example: $20/3$ is written as 6.67; $10/3 \times 10^{-3}$ is written: 3.33×10^{-3} . The number 0.003 has only one significant digit. Do not express variables with more than three initial or trailing zeros. For example, do not express 4.20μF as 0.0000042F or express 25×10^4 as $250,000$ when it should be expressed as: 2.50×10^5.

14. When your work leads to a set of simultaneous linear equations, place the fundamental equations in a column and draw a box around them. Then proceed to solve them by hand, using Matlab, or with a calculator. You do not need to show the steps used to solve the simultaneous equations unless they are being solved by hand.

15. Complex numbers are written in the form of: $3 + j4$ or $6\angle 30^\circ$, where $j = \sqrt{-1}$. Complex numbers are not written as $(4, 3)$, a popular calculator format, or as $4 + i3$ (i denotes current).