Introduction to the Laboratory Portion of ECEN 214

Grading: The laboratory portion of the course will count as 20% of your final grade in the course. Grading for the lab will be as follows:

Lab Reports	**60%**
Prelab Assignments	**30%**
Lab Practicums	**10%**
Total	**100%**

Lab Report requirements are given in the lab manual at the end of each lab description. Lab reports will follow these general guidelines:

1. A title page.
2. A summary of the procedure you performed and how it demonstrated a specific electrical engineering theory. This should be written as a summary of what you did.
3. Data tables with results.
4. Equations used.
5. Any graphs of data requested in the lab.
6. A discussion section. This should include any explanation of results that are *significantly* different than the expected value.

Prelab Assignments are located right before the procedure for each lab experiment. Be sure to complete the prelab before starting the lab as there are often calculations done in the prelab that are needed when performing the lab. **Keep a copy of your calculations and simulations from the prelabs to avoid having to redo work.** Prelabs are to be turned in at the time and place specified by your instructor or TA. Consult your TA or instructor for their policy on late assignments.

Theory Section

In the theory section of each lab, we will include explanations of important electrical engineering concepts you will be exploring in the lab. In order to complete the required prelab, you will need to read and understand the theory and procedure sections of the lab. **Often, you will not be able to perform the lab without completing the prelab.** The prelab assignment will count significantly in your grade. We strongly recommend that you read the lab manual carefully each

week. If you encounter errors or questions regarding the information contained in this lab manual, you can and should consult your TA.

At various points during the semester, you will be asked to demonstrate your ability to use some of the equipment in the lab to perform typical measurements (**Lab Practicums)**. More information can be found in the course syllabus as to the dates and topics of the practicums. Your TA should also provide more detailed information about the Lab Practicums as you get close to those dates.

Participation in the laboratory portion of the course is MANDATORY, even if you have previously attempted this course. You are responsible for completing your lab work each week of the semester and having it checked off by the TA. If there is some special situation, you must discuss it with your TA before the lab work begins for the week. **Only university approved absences or excuses will be accepted to make up any missed work.**

Portable Labs: In order to allow students the flexibility to do the lab work on their own schedule, we will be using a portable measurement device (PMD) to emulate most of the bench lab equipment. This semester we will be using National Instruments Analog Discovery 2 as our PMD. If you have a different device with similar functionality (e.g., the NI myDAQ), you may use that as well, but you should understand that your TA and instructors may not be able to help you as efficiently if you are using a different device than the rest of the class. Even though the PMD will allow your laptop to have the same look and feel of the bench lab equipment, we also want students to get their hands on the real bench equipment. So, in some labs you may be asked to follow up the measurements you make with your PMD with similar measurements using the bench equipment. There will also be some weeks where the TA will test you on your ability to make typical measurements using both the PMD and the bench equipment (Lab Practicums).

Lab Notebook: Each student should maintain a lab notebook. This should be a bound notebook (a spiral is OK, but a bound notebook with numbered pages is better) in which the students will keep notes about what they do in the lab as well as record all their data. Each week, you should get your TA to initial your lab notebook before you leave the lab. You will need to include (as an appendix) a copy of your signed data sheet from your lab notebook with each lab report.

Weekly Lab Schedule:

A sample of how the lab will be run each week is:

1. Most weeks of the course will have a lab associated with it. (The actual start and end date of the lab week may depend on your particular section, your TA should provide you with details). Prior to the start of the lab week, you are expected to read through the lab manual for that next week's lab and complete the prelab section. If you have questions or problems with the prelab, don't hesitate to contact your TA or your instructor for help.
2. Turn in your prelab at the time and place specified by your TA.
3. You should complete all the measurements specified in the lab manual either on your own prior to your scheduled lab section or during the lab section. For most of the labs, the lab work should not take more than 1-2 hours. If you find you are spending more time than this, get with your TA to determine why your lab work is taking an excessive amount of time.
4. If you did your lab work on your own, during your lab section you should meet briefly with your TA to demonstrate how you performed your lab measurements. Your TA may also work with you to use the lab bench equipment to duplicate some of the measurements you made with your PMD. At this time, your TA will also initial the data pages in your lab book, so make sure to bring your lab notebook to your lab meeting.
5. After your lab measurements are complete, you will write up your lab report for that lab and turn it in at the time and place specified by your TA.

Hints for success in lab:

1. Print out your lab each week and make notes on it while you are reading it. Write down any questions for your TA and contact her or him before the start of the lab section if you have trouble with the prelab requirements.
2. Keep the procedure from previous labs as special instructions for using the equipment is not repeated in every lab.
3. Do the prelab before starting the lab measurements and be prepared to turn it in at the appropriate time.
4. Do SPICE/Multisim simulations yourself. If you copy another student's work on **ANYTHING,** you both will receive zeros and the professor will be informed of the incident. Serious violations of academic integrity will be reported to the honor council.
5. Contact your TA whenever you have any questions or suggestions about an experiment. Your TA is here to help you and we are continually trying to improve the labs and desire your feedback.

Safety Issues and Rules in Lab

Here is a list of things to **NEVER** do in the lab (or with your portable lab):

A. **Never** connect the output of a power supply directly to ground.
B. To avoid a mistake such as the one mentioned above, never turn on the power to your circuit until you have checked and double checked the circuit. Be sure all wires are properly connected and there is no short from positive to ground. By convention, positive is a red wire and ground is a black wire. **Ground is often abbreviated GND. Positive is often abbreviated POS.**
C. **Never** connect a voltage source across your body. If you connect a powerful enough source to your body and you touch a ground that is across your body from the source, you could be injured. Your PMD will not generate enough power to hurt you, but some of the bench equipment in the lab might.
D. **Never** have an open container of liquid near your lab work. If something happens and water is poured on a circuit, the source could be grounded. This would result in damaged equipment or damage to your computer. Also, you run the risk of electrocution by connecting yourself to a power supply.
E. Never eat or drink anything in the lab.
F. **Never** perform a lab task that you do not understand. Be sure you are prepared to do the lab before you start your lab work.

Here is a list of things to **ALWAYS** do in the lab (or with your portable lab):

1. Before you start your lab, **read** the entire experiment, **do** the prelab, and **understand** what you are supposed to do for the experiment.
2. Always double check your circuits before you turn the power on. Be sure that you and your partner both understand how the circuit works.
3. When in doubt, have your TA look over your circuit before you turn the power on.
4. **Have fun**. These experiments are designed to be interesting as well as to emphasize the electrical engineering concepts you are learning in lecture.
5. Follow regular building procedures as far as fire alarms and safety in the building goes.

Of special note: In Case of Electrical Shock. Electrical shock is dangerous for you and others. Sometimes shock can throw people. Sometimes it can glue them to the voltage source preventing them from escaping. For more information on the ways current can kill you, please see the textbook.

If you see **someone who is suffering from an accident in lab, DO NOT touch them or move them**. Instead, notify your TA who will take the proper procedure. Call 911. If your TA is not available for any reason, Call 911 and then quickly go to the instrument room to bring a lab technician to the lab. (The exception to this is if you are certified in a relevant First Aid that is needed.)

Most of the time electrical shock is not severe enough to cause serious injury, but be aware that accidents can happen. **Safety in lab is EVERYONE'S responsibility**.