Introduction

The learning system used in ECE 1270 has been designed on the basis of the principles of learning[1-3]. I won't give you a lengthy description of those principles here, but let me state informally two of them that are very important for you to understand because they should guide your work in this course.

1. You learn what you practice and only what you practice.
2. In order to learn, you must obtain feedback about your work.

The first principle is extremely important to you because it tells you that you must practice to learn. You actually learn very little while you are just listening to an instructor, although you may be stimulated and you may get ideas and some information. If you question this statement, test it by listening very carefully to a lecture in which the instructor derives a relation or works out a problem. Then try to do the same derivation or work the same problem without looking at your notes. You will find that you have to do it yourself to learn it. Your learning actually occurs as you practice, that is, as you answer questions, solve problems, design circuits, explain behavior, hook up circuits, measure voltages, measure currents, test devices, plot graphs, take exams, write reports, give talks, and so on. This course is designed to increase your learning through practice.

Now let's discuss the second principle. As you attempt to learn something, for example, to design an RC timing circuit, you must try, find out if what you tried was good

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* The material in this handout is based extensively on concepts developed by Dr. Carl H. Durney, Professor Emeritus of the University of Utah.

1 C. H. Durney, "Principles of Design and Analysis of Learning Systems," Engineering Education, March 1973, pp. 406-409.

2 S. C. Erickson, "Learning Theory and Educational Engineering," ERM, March 1969, pp. 17-18.

3 C. H. Durney, L. D. Harris, and A. W. Woodruff, "Some Learning Principles and What They Mean," Division for Improved Learning, University of Utah, Salt Lake City, Utah.

or bad, correct your errors, try again, etc. Finding out if what you tried was good or bad is called "feedback." The second principle states that you must get feedback to learn. The best way to get feedback is from the real world, which is what you will be doing in the lab when you construct circuits and get them to work. You will also get feedback from your lab instructor as you check off your lab work with them and when they grade your reports. The Study Guides are designed to give you both practice and feedback, and exam solutions will be posted to give you feedback. You should be sure to check exam solutions and find out what you did wrong whenever you do something incorrectly on an exam.

A Description of the Learning System

The system consists of:

a. Learning objectives
b. Study guides
c. Classroom discussions
d. Homework
e. 50-minute exam for each unit of study material, (see below)
f. A two-hour final exam
g. Three laboratory problems with formal reports

Generally speaking, the class work is organized into units, with each unit consisting of a set of learning objectives, a study guide, classroom discussions, and a 50-minute exam that covers one unit. The laboratory problems are an integral part of the course, furnishing the main practice in problem solving. Both the problems and the lab work will be discussed in class.

Laboratory Work

You will be required to keep a laboratory notebook, and you must have a notebook for the first laboratory session. The notebook may have duplicate pages that create a copy of what you write on each page. The notebook should be approximately 8-1/2" x 11" in size and must have fastened-in pages. You will tear out the duplicate pages or scan or copy the

notebook pages and hand them in when you complete each lab, (along with a separate, complete lab report). The notebook must be kept in ink. Date and, if necessary, number each page. The notebook should be a working record. Don't write things on pieces of paper and then go home and copy them in your notebook. Make entries directly into your notebook. You won't have time to write things twice. If you make a mistake, cross it out. Don't spend a lot of time trying to make tables and figures fancy. The main purpose of the notebook is to provide a record of the work you did. Write down all information that is pertinent, including notes about procedures, things that didn't make sense, etc. If your notebook is a good one, you should be able to reproduce work recorded in it one year later, which would obviously require carefully including details about equipment and procedures.

You must attend your laboratory class weekly, and you must show your laboratory instructor your work, demonstrate your measurements, and check off each lab session by having him or her initial and date your notebook. If you do not check off with your laboratory instructor each session, you will be penalized and possibly receive no credit for an entire laboratory assignment.

Only if you receive approval in advance from your TA may you work on your laboratory project at times other than your regularly scheduled laboratory class period.

If bench space is limited, you may share an equipment station. **You must, however, individually design, construct, and test the circuit. You must also make all your own measurements and individually write your formal reports.** As your lab instructor checks off your lab work, he or she will ask you questions to determine whether you have a good understanding of the problem solution, and grade you accordingly. In addition, exam problems will be designed to test your ability to solve problems similar to the laboratory problems, especially on the final exam. If you do not thoroughly understand the laboratory problems, you will find some of the exam problems very difficult.

Matlab® plots must be included in both lab notebooks and formal reports.

The Formal Report

In addition to keeping records in a laboratory notebook, you will write formal engineering reports on the laboratory problems. These reports must be in "IEEE Format modified for single column, double spaced" format, (see download link on course website under "Labs"). Further information on the IEEE format is available in handouts listed in the "Instructions for writing lab reports" in the Labs section on the course website. All rules described in these documents must be followed with the following exceptions:

1) The report is one column rather than two columns, and
2) Section numbering must match the numbers listed in the "Lab Report pts" pages as listed on the course web site.

This means the reports must be written in good form, with complete sentences and neat, well-labeled diagrams, etc. The emphasis is on communication, so the writing should encourage your reader's interest by clearly stating the purpose and objective of the report and providing the necessary information to facilitate your reader's understanding of what you did and how you arrived at your conclusions.

The abstract, introduction, and conclusion sections of your report are very important. The abstract gives a succinct summary of the report. This motivates the reader by providing them with the key points they will be looking for as they read the report. The introduction sets the context in which the laboratory work was performed, gives background information to justify the project, and sets out the organization of the entire document. The conclusion lists key quantitative results, major conclusions reached, and insightful observations regarding why your circuit performed the way it did. The conclusion may also include comments on how performance could be improved upon if, as an electrical or computer engineer, you were tasked to redesign the project.

Sloppy reports are unacceptable. You should write your solutions like you would like to see a textbook example written. Write your report so that one of your classmates who is unfamiliar with the problem could read your report and understand it without

difficulty. Be concise; long reports are neither necessary nor desirable.

Your technical report must be self-contained and not refer to your laboratory notebook. Include copies of relevant Matlab® plots as figures at appropriate locations in the text of the report, (not in an Appendix). Place Matlab® code listings, (which are mandatory), in Appendices. **Matlab® code must be commented, and must have your name in the comments. You must write your own Matlab® code.**

Oral and Written Communication Exercises

You will have two communication assignments in addition to the laboratory reports: an oral presentation lasting five minutes, rehearsed with the CLEAR Center Instructor, and given at the beginning of a specified laboratory session, and a written assignment in which you will thrice submit, (i.e., twice edit), the abstract and introduction to your Lab 1 report.

The oral presentations will be short reviews of work done in the previous laboratory session. You will deliver your presentation to the students in your lab section. An outline for each presentation is posted on the course web site, and talks will be assigned randomly to students shortly into the semester. Students are encouraged to consult with the instructor or TA's if they have any questions about the content of their assigned talk. Students in the laboratory section will fill out and hand in short critiques of each oral presentation. Students will receive points for the number of critiques filled out.

A CLEAR Center Instructor will be available to rehearse students before their talks. Students must make appointments for rehearsals at least one week in advance. If (and only if) you are properly prepared for the rehearsal, you will receive full credit for rehearsing your talk. Talks may not be rehearsed after the date the talk is given in lab. If circumstances warrant, students who miss rehearsal for a pre-approved reason will be asked to solve a technical problem at the board for the instructor as a way of practicing technical presentations.

Grading Procedures

Unit exams. The unit exams will be graded in the conventional way. Partial credit will be given only if the work is explained clearly enough. I will use a detailed grading rubric that specifies how much credit to give for each part of the problem. If you make a mistake in an early step of a problem and then proceed to finish the problem with a correct procedure but incorrect work resulting from the early mistake, you will be given appropriate credit for the correct procedure.

Solutions to the exams will be posted in a glass case near the Electrical and Computer Engineering office soon after the exam is given. If you feel that the grader made a mistake in grading your exam, write on the upper right-hand cover of the exam exactly what you feel was incorrectly graded. If the grader has made a mistake, he or she will change your grade. If you still have a question about how your exam was graded after the grader has seen it, come and see me.

If you request that your exam be regraded, you must do so **before the next exam is given. After the next exam is given, changes in grades on previous exams will not be given.**

Homework. The homework problems will be graded only for correct answers and serious effort. A homework solution displaying both serious effort and a correct approach and answer will receive 1.25 points. A serious effort is worth 1.0 points, and a correct answer is worth 0.25 points. If the answer to a problem is given in advance, a serious effor is worth 1.0 points, and a correct approach is worth 0.25 points. Detailed grading will be left to the student. Solutions to the homework will be posted on the course website soon after the homework is due. **Late homework will not be accepted.** Homework due dates are listed in the course syllabus.

Laboratory problems. Laboratory instructors will grade the laboratory problems. 50% of the grade will be based on the written report and 50% on the copy of your notebook you hand in at the conclusion of the laboratory exercise.

The grade for the written report will be based on how well the criteria in the instructions for writing lab reports are met and on the point breakdown listed on the course web site. The grade for the notebook will be based on how well the criteria in the rules for the laboratory notebook are met and on the point breakdown listed on the course web site.

Oral and Written Communication Exercises.

Grading of oral presentations is as follows:

Oral presentation	20 pts (full points unless talk seriously inadequate)
Rehearsal	10 pts (with CLEAR Instructor)
Critiques	10 pts (proportional to number of talks critiqued)

The written assignment consists of three steps:

1) Students bring a copy of the Lab 1 Abstract and Introduction to lab for peer review. They also perform a peer review for a fellow student.
2) After revising the Abstract and Introduction based on peer review, students hand in the revised Lab 1 Abstract and Introduction for grading by the Course Instructor or CLEAR Center Instructor.
3) After revising the Abstract and Introduction again, based on Instructor's' review, students hand in the Abstract and Introduction for final grading by the Course Instructor.

Grading of the Lab 1 Abstract and Introduction is as follows:

1st submission (Peer reviewed)	10 pts (full pts if writing is adequate)
Peer review another student's work	10 pts (full pts if review is thorough)
2nd submission (Instructor reviews)	20 pts (graded for grammar)
3rd submission (Instructor grades)	20 pts (Instructor assigns grade)

Course grades. Course grades are awarded on the basis of the number of points achieved from the following list of points possible:

	Points Possible
4 unit exams*	300
3 laboratory problems	300
80 homework problems**	100
Communication exercises	100
Final exam	200
Total	1000

* You will take four unit exams but the one with the lowest score will be dropped. Each unit exam is worth 100 points.

* * You will do 18 homeworks but the two with the lowest scores will be dropped. Each homework has 5 problems and is worth 6.25 points.

Your overall grade will be determined by the percentage of total points that you earn according to the following schedule:

Minimum percentage of total points required for the given grade	Course grade
93	A
90	A-
87	B+
83	B
80	B-
77	C+
73	C
70	C-
67	D+
63	D
60	D-
Below 60	E

Schedule

The examinations will be given on dates listed in the syllabus. The dates are firm.

Lab instructors will announce laboratory problem due dates during lab sessions.

Late reports are accepted only with the instructor's consent and receive reduced credit, at the instructor's discretion. Reports handed in up to one week late are graded at 75% of full credit. All work must be turned in by time of the final exam.