

The learning system used in ECE 2270 has been designed on the basis of the principles of learning<sup>1-3</sup>. 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 or bad, correct your errors, try again, etc. Finding out if what you tried was good or bad is

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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.

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

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

<sup>3</sup> 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.



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 him and when he grades 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. Classroom discussions
- c. Study guides
- d. Homework
- e. One-hour exam for each unit of study material, (see below)
- f. A final exam
- g. Four 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 one-hour exam which 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 must 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 and hand in the duplicate pages from your notebook when you complete each lab, (along with a 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 two years later, which would obviously require carefully including details about equipment and procedures. **You must, however, attend your laboratory class weekly, and you must show your laboratory instructor your work, demonstrate your measurements, and check off with him or her each week. If you do not check with your laboratory instructor each week, you will be penalized and possibly receive no credit for an entire laboratory assignment.** You may work on your laboratory project at times other than your regularly scheduled laboratory class period only if you **receive approval in advance from your TA.**



## The Formal Report

In addition to keeping records in a laboratory notebook you will write formal engineering reports on the laboratory problems. These reports need not be typed, or even written in ink. They must be written in good form, with complete sentences and neat, well-labeled diagrams, etc. The emphasis is on communication, so the format 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 Conclusion Section of your report is very important. That is where you must make insightful observations regarding why your circuit performed the way it did and how the performance could be improved upon if, as an Electrical or Computer Engineer, you were tasked to redesign the product.

Sloppy reports will not be accepted. 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 does not know how to solve the problem could read your report and understand it without difficulty, but be concise. Long reports are neither necessary nor desirable.

You may work together in learning how to solve the laboratory problems. However, you must individually design the circuit, construct, and test it. 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 then 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. You must individually write your formal reports.



### Oral and Written Communication Exercises

You will have two communication assignments in addition to the laboratory reports: one oral presentation lasting five minutes given at the beginning of a specified laboratory session, and a written assignment in which you will submit and edit the conclusion 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 will be handed out and 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, and these will be handed in. Students will receive points for the number of critiques filled out. A CLEAR Center Instructor will be available to rehearse students before or after talks. You will receive credit for rehearsing your talk.

### 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 instruct the grader 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 on the bulletin board by 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 basic approach. A homework solution displaying both a correct approach and correct answer will receive 2.5 points. The correct approach is worth 2.0 points, and the correct answer will receive 0.5 points. Detailed grading will be left to the student. Solutions to the homework will be posted on the bulletin board by the Electrical and Computer Engineering office soon after the homework is due. **Late homework will not be accepted.** Homework due dates are listed in the course syllabus.

Oral communication. Grading of oral presentations is as follows:

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

Written communication. The written assignment consists of four steps:

- 1) Students hand in copy of Lab 1 Conclusion to Lab for peer review.
- 2) After revising Conclusion based on peer review, students hand in Conclusion for grading by instructor.
- 3) After revising Conclusion again based on CLEAR Center Instructors review, students hand in Conclusion for grading by course instructor.

Grading of Lab 1 Conclusion is as follows:

1st submission (peer review)	20 pts (full pts unless writing very poor)
2nd submission (CLEAR review)	20 pts (full pts unless writing very poor)
3rd submission (TA grade)	20 pts (Instructor assigns grade)



Laboratory problems. Laboratory instructors will grade the laboratory problems. 50% of the grade will be based on the written report and 50% on your work in the lab as you have it checked off by your lab instructor.

The grade for the written report will be based on how well the following requirements are met.

Communication

1. The report must be written in standard English with complete sentences and good grammar, punctuation, and spelling.
2. The report must have:
  - a. An introduction and conclusions
  - b. Section headings
  - c. Figure numbers
  - d. Figure titles
3. The report must be well organized and the ideas presented concisely so that they can be easily understood.
4. While typing is preferred, the report may be written longhand in ink. Graphs and figures must be neat and understandable, but not fancy and elaborate. Physical appearance is secondary in importance to clarity of communication. The reports should not be long and drawn out.

Technical Content

1. The solution must be correct and complete.
2. Mathematical derivations must be clearly explained.
3. Experimental procedures and results must be clearly described.



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

	<u>Points Possible</u>
4 unit exams*	300
3 laboratory problems	300
40 homework problems	100
2 Communication exercises	100
Final exam	<u>200</u>
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.

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

<u>Minimum percentage of total points required for the given grade</u>	<u>Course grade</u>
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. Typically, reports handed in up to one week late are graded at 75% of full credit. No credit is given for reports handed in more than one week late or after the final exam.