

## ECE-3xxx LABORATORY REPORT POLICY DOCUMENT

### Objective

The objective of this document is to provide a common policy document for lab reporting requirements in all ECE 3xxx laboratories. After reading this document, students should have a clear understanding of the policies regarding lab report preparation and submission. Individual lab courses may specify other requirements in addition to what is contained here.

### Pre-Lab Work

Many labs have pre-lab data sheets in them. These must be filled out **before lab** and turned in at the beginning of lab. The pre-labs are intended to help familiarize you with the experiments and reduce the amount of time spent in the lab. The instructor will grade the pre-labs at the beginning of the lab. Any late pre-labs will automatically receive a zero. Most labs also have lab data sheets that must be filled out during the performance of the lab. You need to have read the lab assignment before entering the lab. You must get the TA to sign both the pre-lab and lab data sheets. **It is your responsibility to see that the TA signs these pages during the lab period.** You cannot blame the TA for “forgetting” to sign these sheets. The TA also keeps a separate list of students whose pre-labs and lab data sheets have been signed off, so forging a TA signature will not do any good and will result in an 'F' being given for the assignment. Any other action taken will follow University policy concerning academic misconduct.

### Due Date

Lab reports are due at the BEGINNING of the next lab (a 1 week period). A late submission will result in a penalty of 15 points per calendar day. **Reports submitted more than one calendar week after the due date will receive no credit.**

### Lab Attendance and Makeup Labs

1. Students are required to perform ALL laboratories and submit ALL reports to pass the lab (and the associated course if there is one).
2. *Excused Absence:* If a student misses a lab because of an excused absence, that student has 1 calendar week to contact the lab TA and schedule a makeup lab. The student will be allowed to perform the lab on the makeup date and submit a lab report with no grade penalty. All makeup lab reports are subject to the same late penalty (15 pts. per calendar day) from the new due date as designated by the lab instructor. If the student has an excused absence but waits longer than a week to schedule the make up lab, then this will be treated as an unexcused absence.
3. *Unexcused Absence:* If a student misses a lab because of an unexcused absence, the student will be assigned a grade of zero. The student must still schedule a makeup lab with the TA, and make a good-faith effort to perform the lab and submit a report to avoid failing the course.

4. All makeup labs must be performed and lab reports submitted before dead days in the fall and spring semesters or the day before the final exam in a summer semester.
5. If a student has 2 unexcused lab absences, then the student will fail the lab (and the associated course if there is one).

### **Lab Grade vs. Lecture Grade**

It is a departmental policy that for all four hour courses which have both a lecture and a lab (such as ECE 3714 or ECE 3724) that students must earn 60% credit in both the lecture and lab in order to achieve a passing grade. This policy is intended to prevent the student from ignoring either the lecture or lab in favor of the other.

### **Plagiarism/Academic Dishonesty**

All labs are individual labs, and you should work alone unless specified otherwise. There is a zero-tolerance policy regarding copying of old lab reports or your classmate's lab reports. Any plagiarism/academic dishonesty will result in an F grade for the assignment. Any other action taken will follow University policy concerning academic misconduct.

Certain misconceptions about plagiarism are common. This explanation is intended to dispel such misunderstanding and to make clear what constitutes plagiarism under University regulations. A person who uses as part of his own writing the words, ideas, arguments, or data of another person without acknowledging what he has borrowed is guilty of plagiarism:

- Quoting material from a particular source without indicating the source and without citing the quoted material as a quotation constitutes plagiarism.
- Using a theme, report or abstract or a portion of a theme, report or abstract written by another person constitutes plagiarism.
- Summarizing or paraphrasing the ideas or arguments of another person without acknowledging the source of the ideas or arguments constitutes plagiarism. It is a common misconception that the mere alteration of every third or fourth word or the alteration of the tense of a verb or the omission of occasional phrases in the original sources frees the borrower of plagiarism; it does not. Such borrowing is still plagiarism because 1) this is not a true paraphrase and 2) the source is not acknowledged.

Generally known facts (the day is 24 hours long; George Washington was the first president of the United States; Lincoln died on April 15, 1865, from an assassin's bullet) do not normally need acknowledgement because they are available in unvarying form from innumerable sources and have simply become common knowledge. A student in doubt as to whether information he/she is using need be formally acknowledged should consult his/her instructor for advice.

## Preparation of Lab Reports and Electronic Submission

All ECE 3xxx labs require electronic submission of your lab report. This means that no paper copy of your lab report will be handed to the TA; instead you will submit your lab report via a Web browser interface. Steps in preparing your lab report for submission are:

1. Prepare your lab report using Microsoft Word or some other text editing package. If you do not use Microsoft Word (.doc file), then you must be able to create an Adobe PDF output file or a Postscript output file from your text editor. No other document formats will be accepted.
2. To submit your lab, point your browser to the link "<http://www.ece.msstate.edu/perl/labs/submitLab.pl>". In order to follow this link, you must know your ECE login/password. ALL students, regardless of major, who take an ECE course (even one that is cross listed as a CS course) receives an ECE login account. You must know this account name in order to electronically submit your lab reports or check your graded lab reports. If this is the FIRST time that you have taken an ECE course, Ms. Katherine Brooks in the ECE main office (Simrall 216) will have an account slip that has the username/password. If Ms. Brooks does not have your slip, or you have forgotten your username/password, then you will need to see Mr. Michael Lane (1st floor, office in Computer Lab, Rm 139). It usually takes a week for new accounts to be added after the 1st class day of the semester.

Once your lab has been submitted, you can use the above link (<http://www.ece.msstate.edu/perl/labs/submitLab.pl>) to verify that your lab actually reached the server (follow the link titled "lab submission report" or use the link <http://www.ece.msstate.edu/perl/labs/checklab>). **It is your responsibility to ensure that your lab was submitted correctly.** If you do not verify that your lab reached the server, and a network or server error prevents the file from reaching the server, then this will be treated as if you never submitted the lab in the first place. All labs are time-stamped upon submission to the server, so the TA will know the exact time at which your lab was submitted. Furthermore, the TA does not have write permission to the directory in which the lab was submitted, so the TA cannot accidentally delete your lab.

You can use the lab submission report link to also check for graded labs. When your TA has finished grading your lab, the submission report will show you a link to the graded lab that will be in Adobe PDF format (your graded lab will always be in PDF format regardless of the document format of the submitted lab). **It is your responsibility to check your graded lab reports.** Complaining at the end of the semester that you did not know the TA grading policy because you never checked your lab grades is not acceptable. The TA should complete grading of your lab report within a 1-week period after the lab due date.

A Frequently Asked Questions (FAQ) list about electronic lab submission is available at the following link: [http://www.ece.msstate.edu/~reese/esubmission\\_faq.html](http://www.ece.msstate.edu/~reese/esubmission_faq.html) .

## Lab Report Formatting

All reports should use a Times New Roman 12-pt font for basic paragraph formatting with the line spacing and margins that are used in this document. No scanned handwritten text/equations/figures are permitted in the report. Any data collected during the experiment should be presented in an appropriate tabular format (most lab assignment data sheets are available in .doc format and you can simply copy these tables into your report). Your lab report should have the following sections:

1. *Title*. The title of your lab report with contact information (your name, email, course, lab section number, TA name) should be the top of the first page of your report.
2. *Abstract*. This is brief summary of the lab experiment and should tell the reader the basics of the experiment performed and principle conclusions/results of the experiment. The *Title* and *Abstract* sections should be on the first page of the report.
3. *Theory*. This section details the theoretical principles behind the experiment being performed. It should contain references to external material contained in your textbook, magazine articles, WWW references, etc. You **MUST NOT** copy verbatim your external reference material - you must read this material and summarize it in your own words. Any direct plagiarism of externally referenced material will result in a 0 assignment for this lab. Also included in the theory section would be any calculations/simulations/derivations you performed in order to design the required circuits for the lab. The *Theory* section should start the second page of the report.
4. *Procedure and Experimental Data*. This section details what you did in the experiment and the data recorded during the experiment. It is **NOT NECESSARY** to duplicate the detailed instructions contained in the lab assignment. Instead, state "The circuit specified in Section 2A, Figure 1 of the lab assignment was constructed, and the following experimental data recorded.". You may copy verbatim the circuit diagrams contained in the lab assignment for reference purposes. If the experiment requires you to design your own circuit, **you must include a detailed schematic of the circuit in your report**. There should be a page break between the *Theory* and *Procedure* sections so that the *Procedure* section starts a new page.
5. *Conclusions*. This section contains any conclusions reached from the performance of the lab experiment. You should also include any problems that you encountered in performing the lab. You should discuss any discrepancies

between experimental results and predicted results, and offer reasons for these discrepancies. The *Conclusions* section should start a new page.

6. *References*: This contains a list of external references for your lab report. The references are sequentially numbered and presented in the order in which they are used in the lab report. The *References* section can be on the same page as the conclusions with no page breaks between them.
7. *Appendixes*. These contain any additional information that might be needed for the report. At a minimum your appendix should contain the answers to the pre-lab questions. If your lab requires you to write a computer program, the listing of the program with comments should go in an appendix. The *Appendixes* can be on the same page as the references section with no page breaks between them.

Appendix B contains a sample informal lab report. The formatting of figures, tables, and equations follow IEEE 2000 document formatting rules (see <http://standards.ieee.org/guides/style/index.html - contents> ). Any figure or table included in your report should be referenced within your text (i.e. "The circuit constructed for the first part of the experiment is shown in Figure 1"). Do not put a figure or table in the report and leave the reader wondering as to its significance or meaning.

## Formal versus Informal Lab Reports

Some labs will be designated as requiring a *formal* lab report. The only difference between a *formal* and an *informal* lab report is the depth and completeness of the theory section. For a formal lab report, **you are required to have at least two other external references besides your textbook, lab assignment, and data sheets**. These references can be other textbooks, relevant magazine articles, Web articles, etc. For formal lab reports, you **MUST** provide your TA with your external reference material. You can do this via one of several ways:

1. a hardcopy of the source material used as a reference
2. a URL (<http://...web Link>) to the material (broken links are counted as missing material!!)
3. a scanned electronic copy of the material included as an appendix in your report.

If you turn in a hardcopy of your external material, this must be provided at the beginning of the lab in which the report is due with your name/section written on each page.

The *Theory* section for a formal lab report must contain at least 2 pages of text (figures/pictures do not count towards the page count). This means that your theory section of a formal lab report will normally be at least 3 to 4 pages including figures. Using larger font, margins, or line spacing as a way of filling out the theory section will result in a 0 for the assignment. *For formal lab reports, your lab assignment may specify*

*explicit theoretical topics/questions to be addressed in the theory section as way of helping you determine what should be contained in this section.*

The *Theory* section of an informal lab report contains a brief description of the theoretical principles of the experiment, typically paraphrased/summarized from information contained in your textbook. The *Theory* section for an informal lab report should be a least 1 page with approximately 1/2 of the page containing text. The example lab report contained at the end of this document is an informal lab report.

## **Lab Report Grading**

Lab report grading is based upon the following:

1. Are all the required sections included?
2. Is the lab free of spelling mistakes and gross grammatical errors (i.e., missing words in sentences, sentence fragments, incorrect word usage like 'their' for 'there', etc.). See Appendix A for examples of gross grammatical errors.
3. Is the information included in the theory section relevant to the lab or just filler material?
4. Are all required experimental and pre-lab data included in the report?
5. Are all of the reference materials provided for a formal report? (URL web links must be specified correctly! Broken links will be counted as missing reference material).
6. Are figures/equations formatted neatly and professionally? No scanned handwritten figures/equations are allowed. For complex equations, use an appropriate tool such as the Microsoft Equation editor that is present in Microsoft Word.

You cannot achieve a grade of 'A' (90%) for your lab assignment if:

1. You did not complete the entire lab or did not complete the pre-lab.
2. You have a missing section, missing experimental/pre-lab data, or missing reference material (formal lab report).
3. You have more than 3 combined spelling/gross grammatical errors (see Appendix A for examples of gross grammatical errors).
4. You have major violations of the formatting guidelines presented in this document.

Be sure to use the spell and grammatical checking features of your word processor package in preparation of your report.

## **Writing Help**

The ECE Writing Resource Center is located at <http://www.ece.msstate.edu/services/writing> . This page has links to different resources that will help you improve your technical writing skills. Appendix A has information on common grammatical problem areas.

## **Questions about your graded lab report**

If you have a question or complaint about your graded lab report, you must first contact your TA. If the problem is not resolved after you have talked to your TA, then contact the lab coordinator for the lab (see the WWW page for your lab course - it should have the email address of the lab coordinator). You should send an email to the lab coordinator that details the problem, and the result of your discussion with the TA about the problem. You must 'CC' the lab TA on the email. All TAs must provide students with both email addresses and office hours.

## Appendix A: Grammatical Problem Areas and Examples

Here is a list of key problem areas with correct and incorrect examples of each.

1. Maintain subject-verb agreement in sentences. Put singular verbs with singular subjects and plural verbs with plural subjects.

**Incorrect:** The need for low power designs have become quite important in many areas.

**Correct:** The need for low power designs has become quite important in many areas.

2. Make sure that your sentences have both a subject and a verb and form a complete thought.

**Incorrect:** Although the problems of routing and scheduling are interdependent.

**Correct:** Although the problems of routing and scheduling are interdependent, they can be addressed together.

3. Avoid beginning sentences with phrases such as "There are," "This is," and "It is." Make your subjects specific and your verbs active for the reader.

**Incorrect:** There are a number of operational amplifiers that act as processing elements.

**Correct:** A number of operational amplifiers act as processing elements.

4. In general, avoid cluttering your writing with passive voice. Try to phrase each sentence in active voice to keep your reader engaged in the text.

**Incorrect:** The performance measures of a network are improved by the use of a routing algorithm.

**Correct:** A routing algorithm improves the performance measures of a network.

However, the passive voice is preferable in the following four instances\*

- When the active agent is clear from the context of the writing
- When the active agent is unknown
- When the active agent is less important than the action
- When referring to the active agent is somehow embarrassing, dangerous, or otherwise inappropriate

5. Try to avoid repetitious phrases in paragraphs. Do not begin each sentence in a paragraph with the same word or phrase.

**Incorrect:** One researched this paper diligently. One also distributed his findings to a prestigious journal. One has gained great success from his article.

**Correct:** The scientist researched his paper diligently. After he finished, he distributed his findings to a prestigious journal. From this article, the scientist has gained great success.

6. Paragraphs should discuss one main topic. When beginning a separate topic, start a new paragraph.

**Incorrect:** The method of Lagrange multipliers varies the coefficients of connection weights in the neural network. Using this method allows the connection coefficients to fluctuate dynamically as the system state changes. A routing algorithm improves the performance measures of a network. This method also trains the network to adapt to abnormal network conditions.

**Correct:** The method of Lagrange multipliers varies the coefficients of connection weights in the neural network. Using this method allows the connection coefficients to fluctuate dynamically as the system state changes.

A routing algorithm improves the performance measures of a network. This method also trains the network to adapt to abnormal network conditions.

7. Make sure to separate two independent clauses connected by "and," "but," or "or" with a comma.

**Incorrect:** Humans process information at a slower rate than digital computers but humans are more efficient in solving complex computational problems than digital computers.

**Correct:** Humans process information at a slower rate than digital computers, but humans are more efficient in solving complex computational problems than digital computers.

8. Separate subordinate clauses that begin sentences from the remainder of the sentence by placing a comma between them.

**Incorrect:** To start the simulation of the network set input voltages of all neurons at a zero value.

**Correct:** To start the simulation of the network, set input voltages of all neurons at a zero value.

9. Use "its" and "it's" in the correct context in your paper. "Its" acts as a possessive adjective, and "it's" acts as another way of saying "it is."

**Incorrect:** When all of a neuron's output voltages reach saturation values, the system reaches it's final stable state. A neural network can be driven into a stable equilibrium state, and then its used to solve a specific optimization problem.

**Correct:** When all of a neuron's output voltages reach saturation values, the system reaches its final stable state. A neural network can be driven into a stable equilibrium state, and then it's used to solve a specific optimization problem.

*NOTE:* In general, you should avoid contractions like "it's" in most technical writing situations.

**10. Avoid using slang in professional papers.**

**Incorrect:** The manufacturers of consumer electric products have begun to use analog fuzzy control technology a lot.

**Correct:** The manufacturers of consumer electric products have begun to use analog fuzzy control technology extensively.

**11. Remain consistent when writing numbers. Spell out numbers between zero and nine, but use numerals for any number above nine (11, 12 13, 14....). However, when a paragraph contains a combination of numbers, write them all numerically.**

**Incorrect:** Figures eight and 12 support the Hopfield neural network solution.

**Correct:** Figures 8 and 12 support the Hopfield neural network solution.

Other guidelines for writing numbers are as follows.

Use Words For...	Use Numerals For...
The first number in a phrase with multiple numbers ( <b>ten</b> 6-bit buffers)	Units of measurement ( <b>5</b> centimeters, <b>8</b> picas)
Fractions without a whole number ( <b>one-fourth</b> , <b>seven-eighths</b> )	Fractions with a whole number ( <b>19 3/4</b> inches, <b>7 3/4</b> miles)
	Numbers with decimals ( <b>6.37</b> )
	Page numbers (Page <b>85</b> )
	Chapters (Chapter <b>3</b> )
	Volumes (Volume <b>5</b> )
	Figures and tables (Figure <b>5</b> , Table <b>6</b> )

**12. Always make sure to check for misspelled words in your writing. Do not rely upon spellcheckers because they may not catch all of your errors.**

**Incorrect:** Analog signal processing acts faster than digitil signal processing.

**Correct:** Analog signal processing acts faster than digital signal processing.

**13. Correctly identify nouns and phrases using articles (a, an, and the).**

**Incorrect:** With rapid increase in demand of portable devices, need for low-power devices has become important.

**Correct:** With the rapid increase in demand of portable devices, the need for low-power devices has become important.

14. In general, avoid writing professional documents in first person (I, me, we, our). Use third person (he, she, it, they, most other nouns) unless you need to use first person for clarity.

**Incorrect:** I observed that neither of the two values correctly corresponds with the problem.

**Correct:** Neither of the two values correctly corresponds with the problem.

15. Use hyphens to join two- and three-word modifiers that work together as one modifier *before* a noun.

**Incorrect:** The memory design project uses 8 way interleaving.

**Correct:** The memory design project uses 8-way interleaving.

16. When using acronyms, define them before using the abbreviation.

**Incorrect:** BellSouth measures its QoS by the customer reaction to its new voice modulated devices.

**Correct:** BellSouth measures its Quality of Service (QoS) by the customer reaction to its new voice modulated devices.

17. Always use italics for variables in formulas.

**Incorrect:**  $\underline{k} = \underline{C} - 1$

2m-length polynomials

**Correct:**  $\underline{k} = \underline{C} - 1$

2*m*-length polynomials

## **Appendix B: Sample Lab Report**

A sample lab report is provided beginning on the next page. Microsoft Word users can use this as a starting template for lab reports.

## **Inverter Operation**

**Joe Schmoe (js1@ece.msstate.edu)**  
**ECE 3714, Section 01**  
**TA: Jackie Chan**

### **Abstract**

Inverters are basic logic gates that perform the Boolean NOT function. Two inverters were connected in series and a buffer functionality was demonstrated. The intermediate point between the two inverters was also probed to verify that the circuit functioned correctly.

## Theory

A Boolean NOT function has the properties that an input of logic '0' yields an output of '1', and an input of '1' gives an output of '0'. A Boolean NOT function can be implemented by a CMOS inverter [1] using the transistor configuration shown in Figure 1.

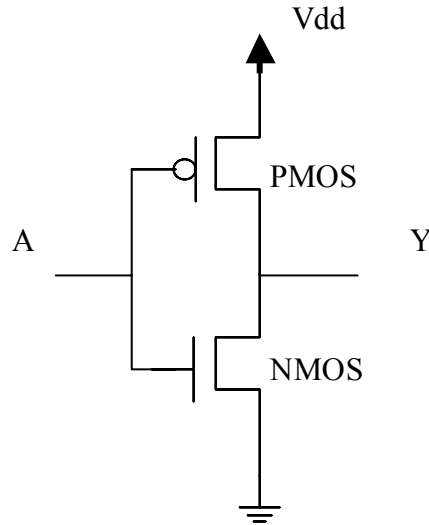


Figure 1 - CMOS inverter

$V_{dd}$  represents the power supply voltage. The bottom NMOS transistor conducts when  $A = V_{dd}$  (a HIGH voltage level) which means that the output  $Y$  will be pulled to GND (or 0v). The top PMOS transistor conducts when  $A = 0v$  which means that the output  $Y$  will be pulled to  $V_{dd}$ . If logic 0 = 0v, and logic 1 =  $V_{dd}$ , then this transistor configuration performs the Boolean NOT function.

The logic symbol for a Boolean NOT function is given in Figure 2.

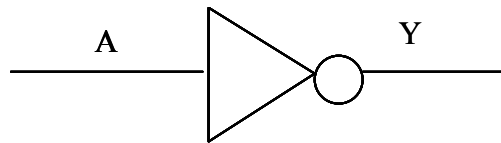


Figure 2 - Logic symbol for inverter

Integrated circuits such as the 74HCT04 and the 74HC06 [2] implement six CMOS inverters in one 14-pin DIP package. The operating voltage ( $V_{dd}$ ) of the 74HCT04 can range between 4.5V to 5.5V while the 74HC04 ranges between 2 and 6V. The propagation delay for the 74HCT04, 74HC06 at nominal operating conditions ( $T = 25^{\circ}\text{C}$ ,  $V_{dd} = 5\text{V}$ ) is 6 ns.

### Procedure and Experimental Data

As per Section I in the lab assignment [3], two CMOS inverters (74HCT04) were connected in series (Figure 3).

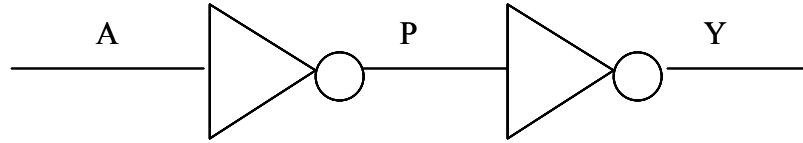


Figure 3 - Two inverters in series

A switch input was connected to input 'A', and LEDs were connected to points 'P' and 'Y'. Table 1 gives the data recorded during circuit operation.

Table 1 - Inverter experimental data

Switch A	LED P	LED Y
Down	ON	OFF
Up	OFF	ON

## Conclusions

The two inverters in series functioned as a Boolean buffer function. Replacing the values in Table 1 with their corresponding voltage values produces Table 2 as shown below.

Table 2 - Voltage values for experimental data

Switch A	LED P	LED Y
0 v (L)	5 v (H)	0 v (L)
5 v (H)	0 v (L)	5 v (H)

Note that the output  $Y$  has the same value as input  $A$ . This is because:

$$P = A' \quad (1)$$

$$Y = P' \quad (2)$$

If we substitute  $A'$  for  $P$  in Equation (2), we get:

$$Y = (A')' = A \quad (3)$$

Equation (3) is the equation for a Boolean buffer function.

## References

1. Vranesic, Zvonko and Stephen Brown, *Fundamentals of Digital Logic with VHDL Design*, McGraw Hill, 1999, pp 72.
2. "CD74HC04, CD74HCT04, CD74HC04, CD74HCT04 High Speed CMOS Logic Hex Inverter". 1997. <http://www-s.ti.com/sc/psheets/schs117/schs117.pdf> (17 Aug. 2001).
3. "A Simple Logic Gate". 2001. <http://www.ece.msstate.edu/~reese/EE3714/labman/lab2.pdf> (17 Aug. 2001).

## Appendix A: Pre-Lab Answers

Question 1: Fill out the table below for two inverters connected in series:

Switch A	LED P	LED Y
Down	ON	OFF
Up	OFF	ON

Question 2. How many transistors are contained in a CMOS inverter? \_\_\_\_\_ 2 \_\_\_\_\_