

ECE GUIDE TO LABORATORY REPORT WRITING

Fall 2020

Introduction

This ECE Guide to Laboratory Report Writing describes how students should prepare laboratory reports for the following but not limited to undergraduate courses:

- ECE 100 Introduction to the Profession I
- ECE 213 Circuit Analysis II
- ECE 218 Digital Systems
- ECE 311 Engineering Electronics
- ECE 319 Fundamentals of Power Engineering
- ECE 405 Digital and Data Communication Systems with Laboratory
- ECE 407 Introduction to Computer Networks with Laboratory
- ECE 411 Power Electronics
- ECE 412 Hybrid Electric Vehicle Drives
- ECE 419 Power Systems Analysis with Laboratory
- ECE 423 Microwave Circuits and Systems with Laboratory
- ECE 429 Introduction to VLSI Design
- ECE 436 Digital Signal Processing I with Laboratory
- ECE 441 Microcomputers and Embedded Computing Systems
- ECE 446 Advanced Logic Design

Some of these courses require shorter reports than others, and some of them require a special format. Nevertheless, you need to turn in well-structured and complete engineering lab reports. This Guide describes the structure of a good engineering report, explains the need for each section, and outlines the content of these sections. It introduces some standard conventions and rules for writing reports of professional quality. It also includes a checklist to help you be sure that your report is complete.

You are expected to follow these instructions and prepare reports in the prescribed format. Reports will be reviewed on the basis of instructions contained in this document. **Grades will be strongly affected by the quality of your reports.**

Need for Report Writing

According to recent nationwide surveys, engineers spend at least 50% of their time writing reports and memoranda. The quality of oral and written reports presented by working engineers is invariably one of the criteria used by their superiors in performance evaluations. The ability to write a good, professional-quality report is an essential, marketable skill. Therefore, all engineering education must include training and practice in report writing. The ECE Department is committed to providing its students with the incentives, opportunities, and guidance to develop this skill.

Advantages of a Standardized Format

This Guide describes the various kinds of engineering reports, outlines the sections, and describes the material that should be included in each section. This is a format that has evolved over time in engineering practice. While there is no single perfect format, several very good approaches exist that are broadly similar. By using a checklist and a standardized format, an engineer can ensure that the final report is well-written and complete, and that readers who have different interests and needs can find the information they seek from the report with minimum effort. Using standard formats also cuts down on the time required to write a report.

Engineering professionals write several different kinds of engineering reports. The form, length, content, and emphasis are determined by the purpose of the report and the intended audience(s). However, all engineering reports are similar, and include sections that describe objectives, methods and procedure, results, and conclusions.

A large number of references are available on engineering report writing. However, every effort has been made to ensure that this Guide is the primary reference on report writing that is needed for the ECE laboratory courses.

Intended Readership

Although as a student you can expect that the grader will read your report in its entirety, engineering professionals know that only a few experts in their own field will read their complete report – and only if they continue to be impressed by the relevance of each individual part of the report. An engineering report prepared in a typical organization is read by a number of different people, with differing backgrounds, interests, and needs. Different parts of a report may be read by different people.

Some individuals might be interested in the comparison of theory with experimental results. Others might be interested in the significance of the results and the conclusions that are drawn from them. Still others would want to know the calculations and both the accuracy and the precision of the results.

At yet another level, a manager who seeks specific information to make important decisions about a project might look at only a brief summary of the report, together with the conclusions and recommendations.

Engineering information is also frequently reported to non-technical readers who need to assess the impact of the report without having to understand all the technical details.

Senior executives in a company frequently look for a summary of the report that extracts the information of principal importance, and usually for the conclusions and recommendations.

Someone next in the chain of command would probably examine the report more closely for a description of the results.

Only those with a direct interest in, or immediate contact with, the project or a similar project elsewhere would read the report completely.

Professional laboratory reports are written to meet the needs of all these individuals. Because they are an important part of your pre-professional training, laboratory reports written for ECE courses should also be written to satisfy the needs of this varied readership. Thus, you will find that some repetition of information in different sections of the report is often necessary, perhaps with a difference in emphasis or detail.

As in all professional writing, clarity and precision in both language and calculations are essential in an engineering report. Figures, charts, tables and graphs should be used whenever they would be helpful. They should be labeled with an identifying number as well as a title. This Guide describes a report structure that satisfies these various requirements.

Time Required for Report Writing

Students in laboratory courses often feel that an excessive amount of time is needed for the preparation of laboratory reports, and that the return on this investment of time (in terms of the GPA) is inadequate. In fact, students who can report on their laboratory work in clear, organized reports receive higher grades than those who cannot. While report writing can indeed be time intensive, the time is well spent, because it provides you with the opportunity to develop or improve a skill that will be extremely valuable in your future career. Frustrations and problems related to report writing can be minimized by proper planning. Try to schedule your weekly activities to allow enough time for writing laboratory reports. As you become more proficient with lab reports, the time required decreases. Remember, quality and completeness are much more important than quantity and excess wordiness.

Use of MS Office 365 Tools for Your Laboratory Writing

All laboratory reports for ECE courses must be prepared and typed using computer software tools like Microsoft Office 365 (Word, Excel, PowerPoint). Hand-written reports may not be acceptable as well-typed and organized reports are the standard practice today in most organizations. For your Windows or Mac laptop/desktop computers, you may install **Microsoft Office 365 for Education** (<https://www.microsoft.com/en-us/education/products/office>) **by using your @hawk.iit.edu email address for free**. If you do not have independent access to a computer, Illinois Tech's academic computer labs, classrooms and kiosk PCs are available for use throughout the campus (<https://ots.iit.edu/classrooms-labs/computer-labs-classrooms>). Most word processors have useful features that significantly enhance the capability to produce a professional-quality report. These features include formatting, outlining, and spelling and grammar checkers.

Using the MS Office 365 Tools and one standard format in all the laboratory courses will increase your writing efficiency. You may use **Word** for writing your laboratory reports, **Excel** for tabulating, drawing graphs and analyzing measurement recordings, and **PowerPoint** for preparing your presentations, drawings for systematic flowcharts and more. For longer reports, time is usually spent most efficiently by working on a report in more than one session. A rough draft is written first and set aside. The rough draft is then reconsidered, edited and polished into the final version in one or more revisions. The final version must be proofread carefully before submission. Allow time to write, edit, and proofread the reports before the final versions are printed. You are professionals whose successful careers will be based in part on how well you can communicate in writing. Start practicing now!

Language and Style

As with all other modes of communication, engineering reports are most effective if the language and style are selected to suit the background of the principal readers. Engineering reports are judged not only on technical content, but on clarity, structure of the report, ease of understanding, word usage, and grammatical correctness.

In general, reports should be written in the third person, past tense, in an impersonal style. The entire report should be written in continuous prose: don't expect figures or equations to serve where sentences and paragraphs are needed. For example "Figure 1 shows the voltage-current relationship of the XYZ diode."

As you edit your report, delete unnecessary words, rewrite unclear phrases, and clean up grammatical errors. Use separate headings for each section. Allow space between sections. Place tables, schematics, or graphs logically, label and number them clearly, and execute them neatly. Aim for a clear, easy-to-read, professional-looking report, with the **essential** information contained therein. [If necessary, put additional material in an appendix.]

Laboratory Report Checklist for ECE Courses

A checklist for laboratory reports is attached to this document. It provides a list of items that must be included. The grader will expect you to follow the checklist carefully. Significant penalties will be imposed for failure to do so.

The length or volume of a report does not determine your grade. Your grade will be based on your adherence to the prescribed format, technical correctness, completeness of the report, completeness of each section therein, overall clarity and conciseness, writing mechanics and style, and timely submission.

Outline of ECE Laboratory Report

An outline of a typical laboratory report is also attached. Use it along with the checklist to make sure that your report is complete, correct, and in the prescribed format.

Grading

Laboratory reports will be graded separately for technical content, and for writing quality and style. The weight of each component in computing the overall score for the report will be determined by the course instructor. The Teaching Assistant for the course will assist in the conduct of the laboratory experiments and grade the reports for technical content and writing quality. In most ECE lab courses, experiments are usually carried out by groups of students. It is expected that each member of a group will follow an identical procedure in the laboratory and use the same set of data. Members of a group are also encouraged to discuss the analysis of data with one another. However, preparation of the report and the discussion and interpretation of the results contained therein must be the **sole effort of the individual student** submitting the report.

Tutoring Assistance

Illinois Tech's Writing Center provides help for students with writing questions. Students can improve their grade in the course by working with the staff in the Writing Center.

Location: Siegel Hall, Room 232 and 233

Web site: <https://www.iit.edu/humanities/student-resources/writing-center>

Phone: 312-567-3476

In addition, samples of Illinois Tech student laboratory reports are available from your Teaching Assistant for your use as examples and illustrations of these guidelines.

OUTLINE OF ECE LABORATORY REPORT

1. Cover/title page

- a. Your name
- b. Your laboratory partners' names
- c. Course number and section
- d. Your TA's name
- e. Experiment number and title
- f. Date of experiment
- g. Due date of laboratory report

2. Introduction

- a. Purpose
 - What is the purpose of this experiment?
- b. Scope
 - What are the limitations of this experiment?

3. Theory

- a. What is the theoretical basis of this experiment? [Brief statement]
- b. What preliminary work was required before the lab session itself?

4. Experimental procedure

- a. Schematic
 - Neatly drawn schematic, block diagram, etc. of the circuits used in the experiment. Include the test equipment.
- b. Procedure
 - Outline the methods used in the experiment.
- c. All apparatus
 - Manufacturer's name
 - Model number
 - Serial number
- d. Results
 - Original data sheet
 - Include date, experiment number, and signatures of the students running the experiment.
 - Graphs
 - Sample calculations

5. Interpretation

- a. Compare your results with the expected results.
- b. Discuss possible sources of error.

6. Conclusions

- a. What can you conclude from the results?

7. References

8. Appendix [If necessary]

ECE LABORATORY REPORT CHECKLIST *

- ☐ The objective of the experiment is clearly described.
- ☐ The purpose and limitations of the experiment are clearly defined.
- ☐ Necessary theory has been included.
- ☐ Pre-lab work is included.
- ☐ The experimental procedure that was used to collect the data is clearly described.
- ☐ The apparatus that was used to collect the data is clearly described.
- ☐ The discussion of data refers clearly to the tables, charts, graphs, etc. but deals with the concepts rather than simply repeating the data.
- ☐ Tables, charts, graphs, etc. are organized logically and labeled clearly.
- ☐ The test results are clearly indicated. (The original data sheet is included.)
- ☐ The test results are correctly interpreted.
- ☐ Proper conclusions have been made from the interpretations.
- ☐ Lab report pages are numbered, and the document is stapled.

* Adapted from Finkelstein, Leo, Jr., *Pocket Book of Technical Writing for Engineers and Scientists*, p. 153, New York, McGraw-Hill, 2000.

GRADER'S ECE LABORATORY REPORT CHECKLIST

Student's name _____

Experiment No. _____ Date _____

- ☐ The report follows the prescribed format.
- ☐ The report is grammatically acceptable.
- ☐ Data, equations, and associated graphs are clearly linked together.
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- ☐ The objective of the experiment is clearly described.
- ☐ The purpose and limitations of the experiment are clearly defined.
- ☐ Necessary theory has been included.
- ☐ Pre-lab work is included.
- ☐ The experimental procedure that was used to collect the data is clearly described.
- ☐ The apparatus that was used to collect the data is clearly described.
- ☐ The test results are clearly indicated. (The original data sheet is included.)
- ☐ The discussion of data refers clearly to the tables, charts, graphs, etc. but deals with the concepts rather than simply repeating the data.
- ☐ Tables, charts, graphs, etc. are organized logically and labeled clearly.
- ☐ The test results are correctly interpreted.
- ☐ Proper conclusions have been made from the interpretations.