Style Guide

Electrical and Computer Engineering

University of Nebraska-Lincoln

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Types of Reports

When documenting the results of an experiment, the format to be used will depend on the primary audience to which the results are directed.

- **Lab Report**—Engineers must be able to effectively communicate the results of their research. Lab reports document findings from a laboratory experiment or class assignment.

- **Executive Summary**—The Executive Summary provides an overview of the results of an experiment. It is usually written for a high-level decision maker who does not have time to read a full research report.

- **Short Research Report**—The audience for this report will have a limited amount of reading time but requires somewhat more information than what is provided in an executive summary.

- **Full Research Report**—This report is prepared for those who require a thorough understanding of the research conducted and the results achieved.

- **Journal Articles/Conference Papers**—These are prepared to more widely distribute research results. The audience is usually made up of experts in the field.

The content requirements for each of these formats, while similar, have specific differences.

Note... Requirements/guidelines provided by a sponsoring individual, agency, or professional society will always take precedence over the guidelines presented here.

Lab Report

Lab reports should be five pages or less in length and contain the following sections.

Introduction. The introduction describes, in one or two paragraphs, the background/theory, the problem to be solved, and the specific objectives of the experiment.

Materials/Methods. This section provides an overview of the experiment, the materials and equipment used, and the methodology.

Results/Analysis. The results of the experiment are described and interpreted, using graphics where appropriate.

Conclusions. This section includes recommendations and implications for the future in a short paragraph.

References. Citations for references to other published materials should be included in IEEE format.

Appendix. Information too long for the main body of the report, such as tabulated data, should be included in an appendix.

Executive Summary

An executive summary, whether it stands alone or accompanies a full report, may be the only document that a decision maker reads. It includes the purpose of the project, key results, recommendations, financial implications, and other information essential to understanding the project. When writing an executive summary, the writer should keep the following points in mind.

It should be short. Unless otherwise directed, an Executive Summary should not exceed one page.

The first several sentences are key. Unlike the body of a research report, where the investigation is presented methodically ending with conclusions and recommendations, an executive summary starts with the most important point that the author wants the audience to remember. The purpose is to catch the interest of the audience in the first sentence and to keep them reading.

Make it self-contained. The executive summary should not refer to information provided elsewhere, i.e., in the body of the report, a website, etc.

Know the audience. Determine how much the audience knows about the subject area. Refrain from using jargon and acronyms if they are not experts in the field.

Graphics are typically not included. One-page executive summaries do not usually include graphics. If a graphic is necessary, it should support a key result or recommendation or communicate informa-tion more quickly than can be done with words. It should not be numbered, have a caption, or be included in the list of figures. The graphic should be referred to, for example, as "the figure to the right."

Short Research Report

A short version of a research report contains the most critical information regarding a research investigation. It is usually no more than ten pages in length and contains the following elements.

Abstract. Not always required for a short research report, an abstract should be written for a technical audience. Its purpose is to provide the audience with an overview or preview of the report's content. Usually only one to two paragraphs in length, an abstract should include the problem or purpose of the report, methodology used, results, and recommendations.

Introduction. The introduction should describe the background/theory, the problem to be solved, the relevance, and the specific goal and objectives of the experiment.

Materials/Methods. This section should provide an overview of the experiment, the materials and equipment used, and the experimental procedures conducted. The description should be clear and concise, such that the audience could replicate the experiment.

Results/Discussion. The findings of the experiment should be described and interpreted using graphics to support the discussion, where appropriate.

Conclusions. The implications and significance of the findings should be summarized in this section, including a discussion of whether or not the objectives were achieved. If the objectives were not met, an analysis of why the predicted results were not achieved should also be included.

References. Citations for references to other published materials should be included in IEEE format.

Appendices. Information that is too long for the main body of the report, such as tabulated data, should be placed in an appendix. A separate appendix can be used for each distinct type of data.

Full Research Report

A full research report contains all of the same elements as the short research report, the primary difference being the amount of detail provided.

A background section may be included (following the introduction). Relevant background theory pertaining to the experiment is presented here. Equations to be used later are introduced along with the underlying assumptions.

Journal Articles/Papers

Most professional societies and journals have their own style guides defining content and format. They are typically available on the organization's/journal's website under "Information for Authors."

Formatting Reports

Page Layout

Margins. Use 1 inch margins on all sides.

Fonts. Many organizations require the use of Times New Roman or Arial fonts in either 11 or 12 point. Research is inconclusive; however, some sources report that using a sans serif font (such as Arial) for body text makes the text harder to read.

Never use more than two font types (one for headings and one for body text) within a research report.

Captions for tables and figures may use a smaller font (9-11 pt. depending on the size used for the body of the report). The same size should be used for all figures and captions appearing in the document.

Spacing. Use line spacing of 1.5 lines, indenting paragraphs 0.5 inch.

Page Numbers. Number all pages (except the title page) 0.5 inch from the bottom and flush with the right margin. The font should be the same as the font used for the body text.

- Use 11 pt. lower case *Roman numerals* for the front matter (abstract, table of contents, list of figures, and list of tables).

- Use 11 pt. *Arabic numerals* for the body and appendices of the report.

Title Page

Title pages should be included with all types of reports. The following elements should appear on the title page (unless otherwise directed by the publishing agency):

- Title
- Author(s) names
- Date
- Course title (Lab Report)
- Course number (Lab Report)
- Instructor's name (Lab Report)
- Names of lab partners (Lab Report)

Reference the report templates for spacing and style.

Front Matter

Table of Contents. A Table of Contents should be used for reports over ten pages in length. It must include the section numbers (if used), section titles, and page numbers.

Lists of Figures. A list of figures should be used for reports containing more than five figures. It must include the figure numbers, figure captions, and page numbers.

Lists of Tables. A list of tables should be used for reports containing more than five tables. It must include the table numbers, table captions, and page numbers.

Body of the Report

Headings. The efficient use of headings in the body is critical in helping the reader to navigate through the report.

- The clearest way to differentiate levels of headings within a report is to use a decimal numbering scheme.

  1.0 Main Heading
  1.1 Second Level Heading
  1.1.1 Third Level Heading

- If a decimal numbering system is not used for headings, the size of font and the font style can be used to differentiate levels of headings. For example:

  ## Main Level Heading
  ### Second Level Heading
  #### *Third Level Heading*

Be sure to use the heading scheme consistently throughout the document.

- Bold headings and capitalize each significant word. Examples of words that are *not* capitalized in a heading are:

  in, of, to, and, but, for, or

- Leave double the spacing being used between paragraphs before a heading. The larger amount of white space clearly indicates the end of a section.

Figures

If a figure is included in a report, it must be referenced in the text.

- Figures are referenced in the text using Arabic numerals. Figure numbers must be referenced in numerical order, i.e., Figure 5 cannot be referenced prior to Figure 1.

- Figure numbers are preceded by either "Fig." or "Figure." Both are acceptable; however, the usage selected should be consistent throughout the document. "Figure" should be spelled out at the beginning of a sentence.

- For long documents, it is acceptable to precede the figure number with a chapter/section number, e.g., Fig. 1-1.

- A figure should be inserted as close as possible to the first mention of the figure in the text.

- Captions for figures should appear *centered underneath* the figure in a font one point size smaller than the body text (unless otherwise directed). A period follows the figure number. The first word of the figure caption is capitalized, and the caption ends with a period. For example:

  Figure 1. An example of a figure caption.

- Figures may be centered horizontally, flush right, or flush left on the page.
  - When using flush right or left, wrap text in a square around the figure.
  - When centering figures on the page, wrap text top and bottom.

- If multiple figures appear on the same page, use a "Z pattern" in placing them on the page. As English speaking readers read left to right, the natural progression in looking down a page is a "z" formation beginning in the upper left

corner. For example, Figure 1 would be to the upper left, Figure 2 to the middle right, and Figure 3 to the lower left.

Tables

If a table is included in a report, it must be referenced in the text.

- Tables are referenced in the text using Arabic numerals in numerical order, i.e., Table 5 cannot be referenced prior to Table 1. Table numbers are preceded by the word "Table."

- For long documents, it is acceptable to precede the table number with a chapter/section number, e.g., Table 1-1.

- A table should be inserted as close as possible to the first mention of the table in the text. Tables should be centered horizontally on the page.

- Captions for tables should appear *centered above* the table in a font one point size smaller than the body text (unless otherwise directed). A period follows the table number. The first word of the table caption is capitalized, and the caption ends with a period. For example:

    Table 1. An example of a table caption.

Equations

- Equations are placed on separate lines and centered horizontally on the page.

- Equations are labeled with Arabic numerals in numerical order, in

parentheses, with the label placed flush right at the margin on the same line as the equation.

- In text, equations are referred to as Eq. 1 except at the beginning of a sentence when "Equation" is spelled out.

- For long documents, it is acceptable to precede the equation number with a chapter/section number, e.g., Eq. (1-1).

- The simplest way to center the equation and place the label flush right in Microsoft Word is to:

    - Set a center tab for the equation.

    - Set a flush right tab for the label.

    - Use the "Insert Equation" option or type in the equation.

    - Place your cursor to the left of the insertion box or in front of the first character of the equation (if typed in), and press tab.

    - Place your cursor to the right of the insertion box or after the last character typed in, and press tab to type the label.

$$(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k} \qquad (1)$$

Lists

- Using bullets to itemize a list makes the list easier to read and lends it greater emphasis.

- Indent from both the right and left margins, and use two different bullets to differentiate main and subbullets. Using more than two types of bullets becomes distracting. For example, use:

- Bullet
  - Subbullet
    - Sub-subbullet

- Numbered lists are used when describing steps in a process or a specific number of items, e.g., the list is introduced by "There are four types of books:…"

- The style of numbering should be consistent throughout the report.

References

The IEEE style should be used for citing and listing references. A complete explanation of the IEEE style can be found on the IEEE Web site at http://www.ieee.org/documents/ieeecitationref.pdf.

Citations in Text

References cited in the text appear on the line, in square brackets, *inside the punctuation*. The reference number may or may not be preceded by the authors' names. For example:

> as shown by Brown [4], [5]; as mentioned earlier [2], [4]–[7], [9]; Smith [4] and Brown and Jones [5]; Wood et al. [7]
>
> or
>
> as demonstrated in [3]; according to [4] and [6]–[9]

List of References

- Reference numbers are set flush left and form a column of their own, hanging out beyond the body of the reference. The reference numbers are on the line, enclosed in square brackets.

- In all references, the given name of the author or editor is abbreviated to the initial only and precedes the last name. Use commas around Jr., Sr., and III in names.

- For one to three authors, separate the names by commas, using "and" prior to the last author's name. If there are more than three authors, use the first author's name followed by et al. (Some entities, such as the National Institutes of Health, do not allow the use of et al. All authors must be listed.)

- If there is a URL included with a print reference, it can be included at the end of the reference.

Examples of references in the IEEE format follow.

Books

[1] J. K. Author, "Title of chapter in the book," in *Title of His Published Book*, xth ed. City of Publisher, Country if not USA: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx–xxx.

[2] J. K. Author, J. T. Author, and R. C. Author, in *Title of His Published Book*, xth ed. City of Publisher, Country if not USA: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx–xxx.

[2] J. K. Author et al., Title of chapter in the book," in *Title of His Published Book*, xth ed. City of Publisher, Country if not USA: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx–xxx.

Reports

[1] J. K. Author, "Title of report," Abbrev. Name of Country, City, Abbrev. State, Rep. xxx, year.

Conference Articles

[1] J. K. Author, "Title of paper," in *Unabbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), year, pp. xxx-xxx.

Patents

[1] J. K. Author, "Title of patent," U.S. Patent x xxx xxx, Abbrev. Month, day, year.

Theses and Dissertations

[1] J. K. Author, "Title of thesis," M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

[2] J. K. Author, "Title of dissertation," Ph.D. dissertation, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

Periodicals

[1] J. K. Author, "Name of paper," *Abbrev. Title of Periodical*, vol. x, no. x, pp. xxx-xxx, Abbrev. Month, year.

Internet Only

[1] J. K. Author. (year, month day). *Title* (edition) [Type of medium]. Available: http://www.(URL).

Hints for Writing Well

Write in third person. Third person is most commonly used in academic writing and is sometimes specifically required. Third person is told from a narrator's point of view, using only the pronouns "he," "she," and "it." First person uses the pronoun "I," and second person uses the pronoun "you."

Use the correct verb tense. The appropriate verb tense depends on the section of the document.

- **Use Past Tense:**

  To describe a methodology and report results. At the time the report is written, the experiment is complete, so past tense is used in the methodology section to record what occurred and the results.

  When referring to the work of previous researchers. When citing previous research, use past tense. Whatever a previous researcher said, did, or wrote happened at some specific, definite time in the past and is not still being done. Results that were relevant only in the past or to a particular study and have not yet been generally accepted as fact should also be expressed in past tense.

  To describe a fact, law, or finding that is no longer considered valid and relevant.

- **Use Present Tense:**

  To express findings that continue to be true. Use present tense to express general truths or facts or conclusions supported by research results that are unlikely to change—in other words, something that is believed to always be true.

  To refer to the report itself. Use the present tense in reference to the report itself and what it contains.

  To discuss your findings and present your conclusions. Also use present tense to discuss the results and their implications. Use past tense to indicate what was found, but use present tense to suggest what the results imply.

Be consistent. Readers unconsciously use consistency to navigate through a document. Any change in format, writing style, word usage, etc., disrupts their flow. Disrupting the flow becomes irritating, and readers may skip ahead or quit altogether.

Use active voice. In an active voice, the subject performs the action denoted by the verb. When using an inactive voice, the subject is no longer active but acted upon. Examples are:

- The director will give you instructions. *(active)*
- Instructions will be given to you by the director. *(passive)*
- The saltwater eventually corroded the metal beams. *(active)*
- The metal beams were eventually corroded by the saltwater. *(passive)*

These examples demonstrate that the passive voice usually requires more words than the active voice to provide the same information. Passive voice conceals who or what does the action and contributes to a lack of clarity. Therefore, using active voice results in a more concise, clear document.

Use parallel construction. The human mind craves form and structure. Parallel construction gives the reader both. Put like ideas in similar grammatical structures.

Parallel construction should be used in headings, enumerations, and bullets and within sentences.

- **UnParallel:**

  Final storage of nuclear wastes involves backfilling the tunnels, the shafts to the surface must be sealed, and surface facilities are decommissioned.

- **Parallel:**

  Final storage of nuclear waste involves backfilling tunnels, sealing shafts to the surface, and decommissioning surface facilities.

- **Inconsistent headings:**

  Use the Correct Verb Tense (has a verb)
  Verb Tenses (no verb)

Reduce clutter. Don't clutter your writing with useless words.

Don't use….	*Use…*
at the present time	now
prior to	before
in the near future	soon
subsequent to	after
to have the capability to	can
in the event that	if

as well as	and
to play a leadership role	to lead

Use good design techniques. Keep the following in mind as you write.

- *Use white space liberally*. Too much text squeezed together makes your report difficult to read and comprehend.

- *Avoid run-on sentences*. Run-on sentences continue line after line, until the audience becomes frustrated and loses the train of thought. The best fix for run-on sentences is to rewrite them into multiple concise, clear sentences.

- *Avoid run-on paragraphs*. Run-on paragraphs are so long that the audience forgets the first part of the paragraph by the time they reach the end of the paragraph. Be sure to start a new paragraph when a subject changes.

- *Use typographic cueing sparingly.* Typographic cueing refers to underlining, boldface, color, and italics. Typographic cues are codes used to signal importance—the more types that are used, the more difficult it is to decipher the code. Use only one code at a time, i.e., do not bold and underline the same text.

- *Never use all caps except for very short phrases*. Readers recognize words by their outline. A word with no ascending or descending letters looks like a rectangular block and reduces reading speed and comprehension by 14-20%.

  CAPABILITY vs. capability

Grammar/Punctuation Challenges

This section is not intended as a substitute for a comprehensive guide to grammar and punctuation. It addresses some of the most common issues. Some of the expert online resources are:

- *IEEE Editorial Style Manual*, http://www.ieee.org/documents/style_manual.pdf

- *American Institute of Physics Style Manual*, http://www.aip.org/pubservs/style/4thed/AIP_Style_4thed.pdf

- *MLA Handbook for Writers of Research Papers*, http://www.mlahandbook.org/fragment/public_index

- *American Chemical Society Style Guide*, http://pubs.acs.org/isbn/ 9780841239999

- *Chicago Manual of Style,* http://www.chicagomanualofstyle.org

- Purdue University Online Writing Lab (Owl) at https://owl.english.purdue.edu/owl

- Grammar Girl Quick and Dirty Tips at http://www.quickanddirtytips.com/grammar-girl

As there may be some variation between these style guides, documents produced by the UNL Department of Electrical and Computer Engineering should comply with this *Electrical and Computer Engineering Style Guide.* For items not covered in this *Style Guide*, writers should review the following in the order listed.

- *IEEE Editorial Style Manual*
- *Chicago Manual of Style*

Commas

- Using a comma before "and" in a series is optional; *however*, it must be used or not used consistently throughout the report

  - Desks, chairs, and cabinets were ordered

- Use a comma before a coordinating conjunction (and, or, nor, so, but, for, yet) only when connecting two complete clauses (subject and verb in both)

  - The FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement. *(No comma as the phrase after "and adjusts" has no subject.)*

  - The FHWA periodically reviews quality issues, and it adjusts its programs and processes to ensure continuous quality improvement. *(Comma as the phrase after "and" has a subject (it)).*

Semicolon

- Use a semicolon instead of a comma before a conjunction when one or both of the complete clauses contains one or more commas.

  - The FHWA periodically reviews quality issues; and it adjusts its programs, processes, and procedures to ensure continuous quality improvement.

Quotation Marks

- Using an apostrophe, or single quote ('), in place of quotation marks (") is not acceptable except when a quote within a quote occurs. In that case, the entire quote is enclosed in quotation marks, and the inside quote is enclosed in apostrophes.

- Semicolons, colons, and dashes always go *outside* of quotation marks.

- Commas and periods always go *inside* of quotation marks.

  - *Note*: In British English, the rules for periods and commas used with quotation marks are not the same as those used in the U.S.

- Question marks and exclamation points *may go inside or outside* of quotation marks depending on the sentence. If they are part of the quotation, they go inside; if they are not part of the quotation, they go outside of the closing quotation mark.

Hyphens

When a term does not follow the rules for hyphenation but has become a generally accepted term in a field of study, the term as used by a majority of experts in the field should take precedence. The accepted usage can be reviewed by accessing scholarly websites.

- The following commonly used prefixes *are not* hyphenated:

anti	inter	pre
bi	macro	re
co	micro	semi
de	mis	super
infra	multi	tri
intra	non	un

  ...unless not hyphenating causes confusion. For example:

  re-creation vs. recreation

- The following commonly used prefixes *are* hyphenated:

  self-   and   post-

- Hyphenate any prefix combined with a proper noun.

  un-American

- Hyphenate compound adjectives modifying a noun.

  On-line system but the system is on line

- Do not hyphenate adverbs ending in "ly."

  Highly paid

Asterisks

- An asterisk always follows a word or phrase.

    The article is by Dr. Jones.*

- When used in a footnote, an asterisk precedes the text

    *Dr. Jones is the author.

Capitalization

- Capitalize proper nouns.

- In headings, capitalize all words except articles (a, an, the), coordinating conjunctions (and, but, or, for, nor), and prepositions.

- Capitalize Internet and World Wide Web.

Miscellaneous

- A versus an

    Most of us were taught that "an" should precede words beginning with a vowel, and "a" should precede words beginning with a consonant. The determining factor, however, is whether a word begins with a *vowel sound*. For example, the following are correct:

    - An MBA degree (vowel sound "em")

    - A historic decision

    - An honorable man (vowel sound "aw")

    - An FBI agent (vowel sound "ef")

- A Federal Bureau of Investigation agent

- Never use an ampersand (&) as a substitute for "and"

    - Except when part of a company name

- Never use the pound sign, "#," as a substitute for number

    - Spell out or use the abbreviation "No."

- Correct usage of e.g. and i.e.

    - e.g. means "for example"

    - i.e. means "that is"

    - Set off both by commas, e.g., or parentheses, (e.g., xx) but be consistent throughout the document

- Beware of its and it's

    - its is possessive; it's means it is

- Plurals of acronyms/initialisms and numbers have no apostrophe, e.g., CRTs, 10s, 1990s.

    (An acronym is an abbreviation that can be pronounced as a word, such as NASA. An initialism is an acronym that cannot be pronounced as a word, such as FBI.)

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