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Second edition, released August 2010, added format and grammar details from Turabian.

Third edition, released March 2011, elaborated on figure and table numbering and figure and table citing, and updated the links to the IEEE Style Manual and the IEEE Author Digital Toolbox.

Fourth edition, released August 2011, added information on equation formatting and numbering, and updated the URLs of IEEE format guidelines.

Fifth edition, released June 2012, simplified the citation of URLs and class notes, and clarified the citation of figures and tables in appendices and attachments.

Sixth edition, released February 2015, updated links to templates.

Seventh edition, released October 2016, clarified figure and table labeling and captioning.

Introduction

Technical reports are written for two different audiences:

1. *Managers*, who want to know (in as few words as possible, and without searching the entire report for the information):
   a. *What* was done and *why*;
   b. Whether or not the project was successful (*e.g.*, were the project goals achieved);
   c. Whether or not cost and time constraints were met, and by how much;
   d. Anything else important enough to call to the attention of management.

2. *Engineers, scientists, and technicians*, who want to know (in sufficient detail so that *they can duplicate the work*):
   a. How it was done (including how unexpected problems were overcome);
   b. How the circuit/system/product performs its intended function.
Formal Reports

A formal report contains the following:

1. **Title Page**: includes the title of the project/report, to whom the report is submitted, by whom it is prepared, the date it is written (not the date the report is due!), and the abstract. (An example title page is shown on the next page.)

2. **Abstract**: a short paragraph indicating what the project was and what solution was found.

3. **Table of Contents**: contains page numbers of the titles and subtitles of different sections of the report.

4. **Introduction**: a brief description of the problem, how it was approached, and what procedure was used to solve it. It may also give the reader some information on what was done in the sections following the introduction (for longer reports).

5. **Development**: describes the details of the methods, procedures, techniques, etc., used in solving the problem. This section usually has subsections such as model development, calculations, experimental procedure, applications, etc.

6. **Discussion**: a discussion of the findings and any discrepancies.

7. **Conclusion and Suggestions**: This section is a brief summary of what the findings were and what the significance of the work is. If it is a research project, it also contains suggestions about future research areas.

8. **References**: This is a list of the books, reports, papers, Internet sources, and computer software that were used to complete the project and write the report. All references listed must be cited in the report; if no references are cited, don’t list any. References are listed in the same order in which they were first cited.

9. **Appendices**: Any method or tool which is not the primary concern of the research or project but is used in the project can be put into an appendix. Listings of computer code developed and used to solve a problem usually go in an appendix unless the purpose of the project is the development of the program itself (in which case the listing belongs in the body of the report). If the output of a computer program (e.g., SPICE or POWERWORLD output) is not discussed in the body of the report, then that output should not be placed in the appendix. Appendices are numbered (or lettered) and are attached to the end of the report in numerical (or alphabetical) order. The order must be the same as the order in which the appendices were first cited in the report. All appendices must be cited by number (or letter) in the text of the report.

Click here to download a formal-report template in MS Word format.
Abstract: A fusion reactor was designed, built, and tested. Helium-3 was used for fuel because another design group cornered the market on deuterium in Platteville. The reaction was contained by the magnetic field from a 6-T magnet borrowed from the MRI machine at the Southwest Medical Center. The calculated output-power level was 22.3 MW, but the measured output power was only 2.5 MW for five minutes, after which the reactor overheated and melted through the floor of the Power Laboratory. That’s why the reactor was unavailable for project checkoff. The authors believe that the lava flow that erupted from the Power Laboratory and covered the UW-Platteville campus is sufficient proof that the reactor (1) was actually built and (2) worked, and do not think they deserved the low grade they received for the project.
Informal Reports

An informal report consists of a memo plus attachments and contains the following sections:

1. **Heading** (required): To whom the report is submitted, who wrote it, when it was *written* (*not* the date the report is due!), and what it is about. (An example of the first page of an informal report is included on the following page.)

2. **Summary** (required): The summary is a brief (one or two paragraphs) description of the project and the results, plus a brief mention of cost and schedule (so that managers don’t have to read the entire report to find this information). It should never extend onto the second page of the report and in most cases will not contain figures, tables, or equations.

3. **Design** (optional): Describes how the circuit or system was designed.

4. **Testing** (optional): Describes how the circuit or system was constructed and tested.

5. **Simulations** (optional): This section includes the *results* of any numerical simulations done for the project. (Listings of computer code belong in an attachment unless development of the code was the purpose of the project.) If the simulations are an integral part of the design process, include the simulation results in the **Design** section and omit this section.

6. **Results** or **Conclusion** (required): This section summarizes the results of the project, compares the measured results to the design goals and numerical simulations, gives detailed breakdowns of costs and time spent (if required), etc.

7. **References** (required if any references are cited): This section contains a list of all references cited in the report. If no references are cited, none should be listed. The references should be listed in numerical order (of course!) and in the order in which they are *first* cited. The **References** are *not* placed on a separate page.

8. **Attachments** (optional): Attachments to an informal report serve the same function as appendices in a formal report. Attachments are numbered (or lettered) and are attached to the end of the report in numerical (or alphabetical) order. The order must be the same as the order in which the attachments were *first* cited in the report. *All attachments must be cited by number (or letter) in the text of the report.* Page numbers are not required on attachments.

   In an informal report, each section does *not* have to start on a separate page. However, never end a page with a section heading.

   Click here to download an informal-report template in MS Word format.
To: Prof. D. M. Drury

From: Orville Klutz
Harvey Mudslinger

RE: EE 4610, Laboratory Project #2

Date: 30 February 2008

Summary

A summary for managers should come first, so that they don’t have to read the entire report to find the information of interest to them (e.g., cost and schedule information and whether or not the project was successful).

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The summary is exactly that — a summary. It should not extend onto the second page.

Design

The design process is explained in sufficient detail such that any engineer working in the same field will be able to understand what was done and duplicate the work.

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IEEE-Format Reports

The format (including a template) is given in great detail at

*Click here to download the IEEE format template in Word format.*

Format errors frequently occur because of lack of attention to the following:

1. Figure captions and figure numbering.
2. Equation format and equation numbering.
3. Font types and sizes.
4. Table formats and table numbering.
General Information

Format for Formal and Informal Reports

Except as listed below, use the format specified in *A Manual for Writers of Research Papers, Theses, and Dissertations*, 7th ed., by Kate L. Turabian (University of Chicago Press, 2007). Several copies of this book are in the UW–Platteville Library; they are available to students at collaborative sites or taking courses by streaming video through Interlibrary Loan, or this book can be purchased from Amazon.com. Quick-reference highlights are given here. (NOTE: This is only a partial listing of format requirements. For complete information, see *Turabian.*)

1. **Tables and Figures:** (from sections 26.1 – 26.3 of *Turabian*)
   a. All tables and figures—*including those in appendices and attachments*—must be numbered or lettered and cited by that number or letter in the report.
   b. The first figure (or table) cited must be Fig. 1 (or Table 1), the second cited must be Fig. 2, etc.
   c. Unless the table or figure is in an appendix or an attachment, it should be placed as soon as practicable after its first citation and in the same section of the report as that citation.
   d. Table captions (required) are left-justified just *above* the table, with the word *Table* (capitalized) followed by the table number (or letter) and a period. The period after the table number should be omitted if the label is used as part of a sentence (e.g. Table 1 shows the measured resistor values for the project.). The caption follows the label and is terminated with a period, even if the caption is not a complete sentence. If the caption runs to more than one line, it is *single-spaced.*
   e. Figure captions (required) are left-justified just *below* the figure, with the word *Fig.* (capitalized) followed by the figure number (or letter) and a period. The period after the figure number should be omitted if the label is used as part of a sentence. The caption label follows and is terminated with a period, even if the caption is not a complete sentence. If the caption runs to more than one line, it is *single-spaced.*
   f. Colors and shadings may be used in figures, but the figures must still be understandable if photocopied in black and white.
   g. Decimal points in columns of tabulated data, for all entries in the column that have the same units, should align.
   h. Figures and tables must be oriented to be upright either when the page is held normally or when the page is rotated ninety degrees clockwise.

2. **Typeface, Line Spacing, and Pagination:** (from sections A.1 – A.2 of *Turabian*)
   a. Use the same typeface (e.g., Times Roman, Palatino, etc.) throughout the report.
   b. Leave a margin of at least one inch on all sides of the page, except for page numbers.
   c. Double-space the text of the report.
   d. Single-space each reference, but double-space between references.
   e. Single-space table and figure captions.
   f. Left-justify the text. *Do not use simultaneous left-right justification.*
   g. Page numbers:
      Formal reports — *Consistently* in either the top margin, either centered or at the right margin, or centered in the bottom margin. The title page has no number; the page after the title page is page number one.
Informal reports — *Consistently* in the top margin, either centered or at the right margin. The first page is page number one but the number does not appear.

**Format Exceptions for Formal and Informal Reports**

The following are *not* taken from *Turabian*:

1. **Type Font:** Use 11- or 12-point type for the body of the report.
   
   a. **Formal reports:** Use 10-point type for figure and table captions.
   
   b. **Informal reports:** For figure and table captions, *unless directed otherwise by the course instructor*, use either the same point size as used for the text or 10-point type *consistently*.

2. **Figure Backgrounds:** Dark backgrounds (commonly produced by SPICE and screenshots) are *not acceptable*.

3. **Schematic Diagrams:**
   
   a. The ground symbol (\[\vDash\] or \[\vDash\downarrow\]) must point downward, not sideways (\[\vDash\uparrow\]) or upward (\[\vDash\downarrow\]).
   
   b. Most computer programs used to generate schematics do not support subscripts, therefore symbols that are subscripted in the text of the report (e.g., resistor \(R_7\)) can be labelled without subscripts (*i.e.*, \(R_7\)) in schematics.

4. **Figures:** All figures must be produced by computer or with drafting tools (straight-edge, template, etc.). *No hand drawn figures, derivations, labels, etc., are allowed!*

5. **References:**
   
   a. Use the method of citing and listing references specified by the IEEE at

   \[\text{http://www.ieee.org/publications_standards/publications/authors/authors_journals.html}\]

   and click on **IEEE Style Manual**. **CLARIFICATION:** For Web pages, the specified IEEE format is

   [1] *Author’s name*. *(year, month, and day accessed)*. *Title of Web page* (including edition, if known) [Online]. Available: URL

   (Note that the date is the date the URL was *accessed* [*not* the day it was created!] and that there is *no period* after the URL.) If the author’s name is unknown (which is frequently the case), substitute the name of the company for which the Web page was created (*e.g.*, Digi-Key, Motorola, etc.) If the company’s name isn’t known either, begin with the access date *(year, month, day)*.

   (1) All references listed must be cited by number in the text of the report or the appendices/attachments.
   
   (2) References must be listed in the same order in which they are *first* cited. Each reference can be cited as many times as necessary, but should be listed only once.
   
   (3) **If no references are cited, don’t list any.**
b. If class notes are used as references, treat them as unpublished private communications (see the IEEE Style Manual referenced above).

c. In industry, project reports are archived someplace (e.g., a manager’s filing cabinet). Therefore reports submitted earlier in the semester may be used as references.

(1) For formal reports, the format is the IEEE standard referenced above.

(2) For informal reports:

Memo to D. M. Drury from Orville Klutz, 30 February 2008. Subject: Laboratory Project 3 — Perpetual Motion Machine.

6. Equations:

a. For formal and informal reports: Equations must be typed in the format used in math or engineering textbooks (i.e., with superscripts and subscripts and without asterisks or dots denoting multiplication), NOT in the format used for computer programming. (HINT: Learn to use the equation editor in WordPerfect or Microsoft Word.) If the equation is numbered (or lettered) for referencing in the text, the number (or letter) appears in parentheses on the last line of the equation and against the right margin.

(1) Correct: 
\[ Y_i = \frac{4X^2 - aX_m}{n} \]

(2) Incorrect: 
\[ Y_i = 4*Xn^2 - a*Xm \]

Explanation: Lack of superscripts and subscripts; asterisk (*) used to denote multiplication, ^ used to denote exponentiation.

b. For IEEE-Format reports, the equation editor in the word processor (e.g., WordPerfect or Word) must be used. The format is in

http://www.ieee.org/publications_standards/publications/authors/authors_journals.html

and click on IEEE Style Manual.

Grammar and Composition

1. Rules:

a. For formal and informal reports, use the rules specified in Sections 20 – 24 of A Manual for Writers of Research Papers, Theses, and Dissertations, 7th ed., by Kate L. Turabian (University of Chicago Press, 2007). A listing of some of the most-frequently violated rules follows. (NOTE: This is only a partial listing. For a complete listing, see Turabian.)

(1) Leave a space between numerals and units. (EXAMPLE: 5 V, not 5V.) If the quantity is used as an adjective, the space is replaced by a hyphen (EXAMPLE: 5-V source, not 5 V source or 5V source.)
(2) Do not split numerals and units between lines of text. (EXAMPLE: “7.2 V” must appear together on one line. “Seven volts” can be split between two lines.)
(3) Do not end a line with a period unless that period denotes the end of a sentence.
(4) Do not end a page with a section heading.
(5) Other people’s work (figures, derivations, measurements, sentences, etc.) must be properly acknowledged.

b. For IEEE-Format reports, use the rules specified in

http://www.ieee.org/publications_standards/publications/authors/authors_journals.html

and click on IEEE Style Manual.

2. Description Details:

Incorrect — To measure the signal amplitudes, I used the oscilloscope. I took one of the thick cables from the wall rack and connected the red clip lead to my circuit where the red clip lead from the function generator was attached. Then I connected the black clip lead to my circuit where the black clip lead from the function generator was attached. Then I connected the BNC connector on the other end of the cable to the Channel 1 input of the scope. Then I got a thin cable with a box labelled 10:1 on it from the rack on the wall and connected it to the end of the 1-kΩ load resistor that had the gold stripe on it. Then I connected the black clip lead from the thin cable to the other end of the 1-kΩ load resistor. Then I made a screen shot of the oscilloscope display and put it in this report as Figure 3. (Explanation: This contains too much unnecessary detail. Managers don’t care and other engineers know how to measure signals with an oscilloscope. Every use of the word “then” in the above is unnecessary.)

Correct — The input- and output-signal amplitudes were measured with an oscilloscope and are shown in Figure 3. A 50-Ω coaxial cable was used as a test probe for the input signal, but a high-impedance probe was used to measure the output signal so that a large capacitive load would not be connected to the output. (Explanation: This says the same things as the above description, but uses far fewer words and actually explains why a high-impedance probe was used — something another engineer might want to know.)

Incorrect — I started biasing the transistor by calculating the value of the emitter resistor. I used the 1/3–1/3–1/3 rule to calculate an emitter voltage of 4 V and chose an $I_C$ of 8 mA. Then I calculated the resistor value from the equation

$$R = \frac{V_E}{\frac{E}{I_C}}$$

which gave me $R_E = 500 \Omega$, but IEEE didn’t have any 500-Ω resistors so I used 510 Ω. Then I calculated the base voltage using the equation

$$V_B = V_E + 0.7$$

which gave me 4.7 V. Then I proceeded to calculate the base resistors . . . ad nauseum
(Explanation: Again, there’s too much unnecessary detail. Managers don’t care about this and other engineers know how to bias a BJT.)

Correct — I biased the transistor at a Q-point of 3.5 V (to get sufficient signal swing) and 8 mA (to achieve sufficient gain). (Explanation: Managers can easily skip this and it tells other engineers all they need to know.)

Common Knowledge

Information commonly known to engineers and engineering managers (Ohm’s Law, Kirchhoff’s Laws, Maxwell’s equations, Newton’s laws of motion, etc.) can be used without citing references.

Report Assembly

Unless specified otherwise by the instructor, reports are to be stapled together (no paper clips!) with a single staple in the upper left-hand corner.
Common Grammatical Errors

1. Writing in passive voice (i.e., the subject receives the action of the verb and there is no direct object) produces many grammatical errors. Writing in active voice whenever possible makes these errors impossible. *Examples:*

   *Incorrect* — (Passive voice) **The output voltage was measured using an oscilloscope.**
   *(Explanation: The voltage could not have used the oscilloscope; “using the oscilloscope” is a dangling participial phrase.)*

   *Correct* — (Active voice) **I measured the output voltage using an oscilloscope.**
   *(Explanation: I was the one who actually used an oscilloscope. Students who do not like to write in first person — or who are required to write in the third person — can write, “The author(s) measured . . .” or “The engineer measured . . .”) Alternate phrasing: **I measured the output voltage with an oscilloscope.** *(Explanation: This construction avoids any possibility of a dangling participle — *with* is a preposition, not a verbal.)*

2. *Data* is the plural form of *datum*. *Examples:*

   *Incorrect* — **This data is . . .**

   *Correct* — **These data are . . .**

3. *It’s* = *it is*; *its* (no apostrophe) = **belonging to it** (possessive form of the pronoun *it*).

4. *Versus* = **opposed to** or **against** (as in a plot of current *versus* voltage or *I* vs. *V*); *verses* = **more than one stanza of a poem.**

5. Unnecessary changes in verb tense.

6. The report describes a laboratory *project* or a design *project*, not a laboratory or a *lab*. *(The laboratory or *lab* is the room in which the measurements were made.)*