Laboratory Report Format[1]
rev 2.1 - 10/24/18

General Info: The lab report must be computer-generated and be subject to professional standards. All figures, tables, and/or graphics must be computer-generated.

Fonts Standard font type and style (e.g. Times New Roman 12-pt.) should be used throughout the report, with the exception of section headings and the title page.

Spelling and Grammar Document should contain no spelling or grammatical errors. Word processor spelling and grammar checking should be utilized.

Figures, Tables and Equations (See guide at end of document for more info)
1. All figures should be computer-generated.
2. All figures included in a paper should be necessary for understanding the results.
3. All figures necessary for understanding the results should be included in the paper (different from 2.).
4. All figures should be simple, clean, and free of elaborate detail.
5. All figures should be mentioned in the text (see Figure 1) and used to help clarify or illustrate a topic being discussed. A figure should not be included if it is not discussed in the text.
6. Figures should be large enough to easily read all details, and be centered horizontally (without word wrapping).
7. All figure labels are numbered consecutively (Figure 1, Figure 2, etc.).
8. All figures should be followed by a caption, which is written below each figure and ended with a period.

Additional Lab Report Information:
1. Each student will submit a laboratory report, unless otherwise informed.
2. Each lab will be graded on proper format, accuracy, substance, neatness, grammar, and obvious effort or lack thereof.
3. All reports are to be written in **third person impersonal** form (do not use, 'I', 'we', or other personal pronouns. This includes "The student")
4. You gain points for complete and thorough discussions showing additional research and an obvious understanding of the principles stated in the objectives.
5. Materials and methods covered in lab exercises will be reflected on exams and quizzes.

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[1] Special thanks to: J. Newman, S.Southhall, R. Buchanan and C Graves for section of this document.

Sections of a Formal Lab Report

1. Title Page: The following is an example of the proper lab report title page format. Substitute information pertinent to the specific lab and course. The title should state as much as possible about the content of the paper, in as few words as possible.

The title page will be a single, whole page <u>centered vertically and horizontally</u>.

(NO PAGE #)

<div align="center">

Laboratory Exercise #1

EPROM Programming
by
Fred Derf

Lab Partner: Jonathan Dough

TECH-3233
Microprocessors
Lecture Section 001
Lab Section 101

Performed on: October 31, 2018

Submitted on: November 7, 2018

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2. Objective(s):   Describe in formal language <u>(third person impersonal)</u> the objective(s) of the lab. This should not just be copied off the lab handout.

3. Introduction / Background: The introduction should inform the reader as to what the problem is, what question will be answered, and why it is important.

The background should describe in detail, the knowledge required to complete the lab. Examples of information to include, but are NOT limited to:
- Theory of operation of major components used to complete the objectives.
- Processor and/or register information necessary to successfully complete the lab. (for Microprocessors and Interfacing labs)
- Theory of operation of algorithms or processes used (when including code).

<u>Rule of thumb:</u> someone else, using the knowledge presented, should be able to complete the task given the introduction and objectives.

4. Materials / Equipment: List all components (including values) and major equipment required to perform the exercise. This is the ONLY section where it is permissible to use a bulleted list.

5. Procedure: For each part of the lab experiment, briefly state what you are trying to investigate in that procedure and describe what was done in setting up your experiment and/or developing your design. Developmental flowchart, system block diagram, theoretical calculations and other developmental diagrams should be included here. These diagrams should be COMPUTER GENERATED using appropriate software. Each separate procedure must begin with a centered, underlined title.

6. Results/Data: This is the ACTUAL implementation (both hardware and software) for your design. This should include Schematic diagram(s), and an explanation of the implemented code (in paragraph form with code segments as required). It should also indicate how the SYSTEM was tested (both HARDWARE and SOFTWARE). A test plan would be appropriate in this section. Save any subjective discussion of your results for the discussion.

Graphs, charts, and tables are often useful in this section (and elsewhere, but less often). They should be labeled consecutively either as Figures or Tables, depending on whether a reader could be expected to set them, e.g., Figure 1, Figure 2, Table 1, etc. Each one should have a caption explaining clearly what it is, if possible without relying on anything in the text. The text should tell the reader when to look at the figures and tables (``As shown in Figure 1. ...''), and it should point out the important points, but it should not simply repeat in writing what they state. Figures and tables may go at the end of the paper, but most readers prefer the tables and figures close to where they are needed, immediately following the declaration. Refer also to the Figure check list at the beginning of this guide.

7. Discussion Discuss your results, particularly as they relate to the stated objectives. Include the reasons for any apparent errors with appropriate supporting information. Include any specific problems encountered during the lab and how they were corrected. Answer any questions which were raised as a result of the laboratory work. Finally sum up the experiment and draw conclusions based on the results of the experiment.

8. Conclusion Your conclusion should restate the key points in the paper, it should NOT state: "I learned what I was supposed to learn, and saw what I was supposed to see and learned a lot from the experience."

9. Appendix The appendix should be for any piece of code or visual aid that takes up more than half of a page. Very short pieces of code can be presented as a figure within the main document text.

10. References: Include all published material ACTUALLY REQUIRED to complete the lab. This section is entitled "References", not "Filler". Use proper bibliography techniques (MLA, IEEE or APA standard) including page and figure references where required.

Examples of
Figures, Tables and Equations

Graphs, Tables, and Figures:

All graphs, tables, figures and equations must be gracefully **integrated** within the other sections of the document, and **not** compiled at the end of the document. Furthermore, these items must be numbered (preferably using Word's Caption tool), must have captions (except for equations), and must be referred to in the body of the report (using Word's Cross Reference tool). The schematic of any circuit used in the lab must appear in a figure. **All visual aids must be computer-generated (not hand-drawn).**

Example formats for graphs, tables, figures, and equations are shown below.
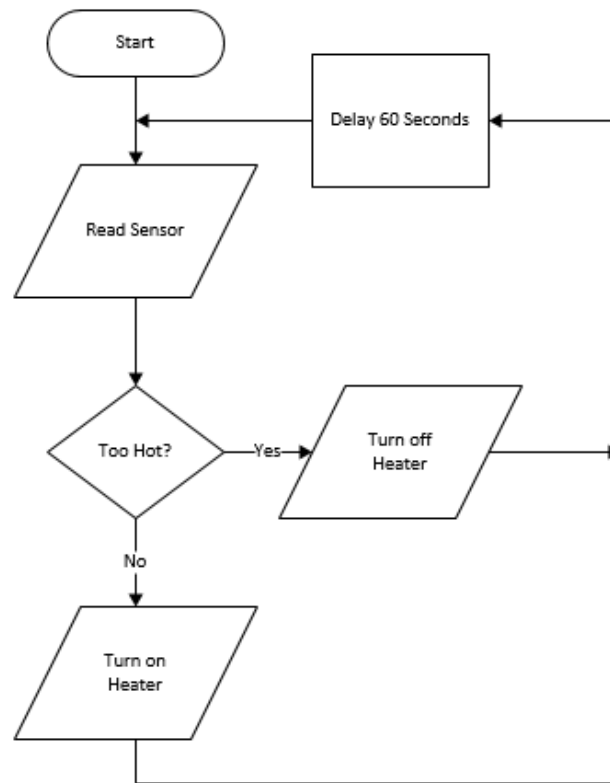
EXAMPLE Figures:

Figure 1 - Thermostat Flowchart

Note: Code **snippets** can be included in reports to highlight sections of code. Do NOT include the full program in the body of the report (unless very short), instead place the full program in an appendix at the end.

To do so, insert the program as text, change the font to Courier New (below it is 10pt). Put a boarder around the code, then use References | Insert Caption.

```
#include <stdio.h>
int main()
{
   // printf() displays the string inside quotation
   printf("Hello, World!");
   return 0;
}
```
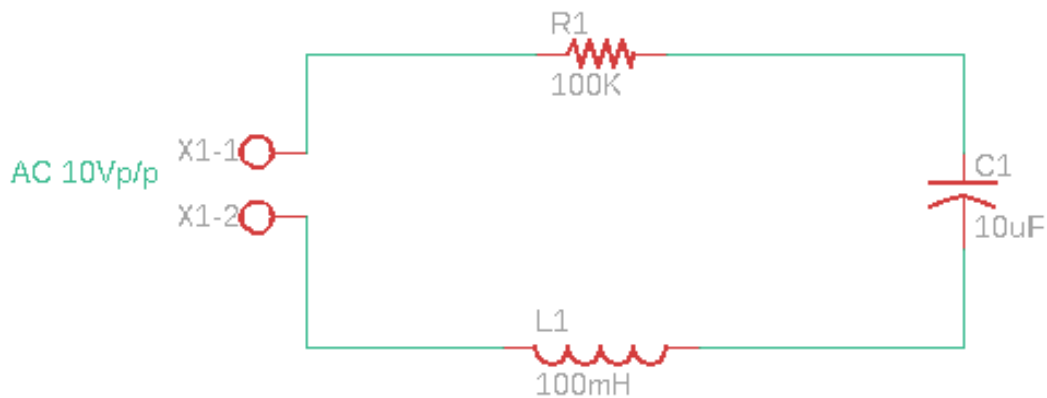
Figure 2 - Hello World Program

Figure 3 - RCL Circuit

EXAMPLE Tables: Note that the caption should appear at the top of the table.

Table 1 - Measured Resistor Values

Nominal Value Marked	Measured Value	Error (%)
1000Ω	900Ω	10
2000Ω	1800Ω	10
100Ω	80Ω	20

Table 2 - CPU12 Instruction Statistics

Instruction	Addressing Mode	Clock Cycles	Bytes of Memory
SUBA $2000	Extended	3	3
TAP	Inherent	1	2
LDAB #$45	Immediate	1	2
MOVB $0234, 5,x	Extended/Indexed	5	4

EXAMPLE Equation: In Word it is best to put equations in a 3x1 table (with no boarders). Use the center cell for the equation (using equation editor to enter the equation). Insert an equation caption, but delete the word "equation" and move the number to the right hand cell and enclose the value with ().

$$Q(t) = \frac{n}{y} \int_0^t z(x)dx + q(0+)$$ (1)

$$Output = A\bar{B}C\bar{D} + AB\bar{C}D + \bar{A}BCD$$ (2)