

## ATCS RESEARCH PAPER GUIDLINES AND REQUIREMENTS

Most colleges and universities require students to be able to communicate in written form at a collegiate level. Meeting that expectation means paying attention to the details in formatting, style and structure. In order to better prepare you for that expectation, similar requirements are in place in this class for ALL written work.

You will be doing a number of short research papers in this class. The content of the papers should be simple and direct. All papers must be typed. Significant points will be deducted for misspelled words, sentence fragments, bad punctuation, poor formatting, informal usage, internal inconsistencies, eye candy, *etc...*

Use “best practices” for the English language. For example, you should not have single sentence paragraphs nor should you end your sentences in a preposition. An example of poor wording is “this is precisely the type of writing up with which I will not put.”

The paper body can contain graphs, calculations and tables. All these visual elements must be uniquely identified as Figure X, Table X, Equation X, *etc.* These identifiers are considered as proper nouns when referencing the associated figure, equation, or table so the names must match. In other words, if you use the label *Equ. 1*, you cannot later reference it as *equation 1*, since there is nothing called *equation 1* in the paper. You must reference it as *Equ.1*. Tables and figures must have a meaningful title or descriptive sub-text (curiously, sub-text is typically easier to write than meaningful titles). If you include sub-text, it should have a smaller point size than the text body. Only include figures, tables, and equations if they are an integral part of the discussion. Never include “eye candy”. All tables and figures must be referenced within the body of the paper. Here are some guidelines in using different elements in your papers:

**NAME AND PERIOD** - For your grade to be recorded properly, it is important to know who you are and which class you are in. If you need help spelling your name or determining which period you are in, seek help from your instructor.

**THE TITLE OF THE PAPER** - Be creative here. Have some fun!

**INTRODUCTION** - This is where you set the stage for the paper. You introduce why you are here in the first place with some background and perhaps a little history. Cite your sources with in-line citations (you can pick the citation format).

**EQUATIONS** - All equations must be entered using an equation editor such as *MathType*. Poorly formatted formulas that are pasted in from *Mathematica* are NOT acceptable. A professional presentation is part of the grade. Hand written equations will NOT be accepted. The product should look professional.

**DERIVATIONS** - It is possible that you will have a derivation in a paper. A derivation is NOT an equation dump. A derivation is a guided tour through a logical sequence of steps associated with the mathematical description of a physical system. Every step in a derivation must be explained. Do NOT assume that the reader can follow your reasoning without words or diagrams. You can assume that the reader understands calculus and can do algebra, so simple steps need not be spelled out one at a time. Avoid colloquial expressions such as “plugging the numbers into Equation 1”. The wording must be more along the lines of “substituting the aforementioned values into Equation 1 yields...”. Think in terms of the actual meanings of the words being used (you plug in a toaster). Formulas and equations are part of the story, so they need to read like the rest of the text even though they should be placed on their own line and be given a unique identifier. Being part of the expository element of the paper, they too require

proper punctuation. Graphs, figures, and tables are NOT part of the story line. They are supporting material that is addressed in the text, but are not part of the actual text flow.

**Graphs** - All graphs must be drawn using Logger Pro, Graphical Analysis, Excel, Mathematica, MatLab, or another technical graphing package. The graph (not just the axes) must be large enough to be useful, but not so large as to simply consume space. Teensy weensy graphs are unacceptable as are huge block graphics that have no real added value. Each axis must have a clear and readable label followed by the units of the labeled quantity in parenthesis. The units may be written out or abbreviated. For example, a graphed quantity might be Acceleration and its units meters/sec<sup>2</sup>. The proper labeling of the velocity axis would be: "Acceleration (meters/second<sup>2</sup>)" or "Acceleration (m/s<sup>2</sup>)". Improper labeling would be to write (m/s<sup>^2</sup>) as the units. You must use proper superscripts. The scale used on each axis must be clearly stated and easy to read. Graphs should have a title and/or descriptive subtext. The title should be above the graph and in an appropriately sized font (huge fonts that dwarf the graph are unacceptable). The title should not be a repeat of the axis labels. It should clearly differentiate the graph from any others. For example, "Graph II - Force on an Air-Cart *vs.* the Resulting Acceleration to Determine Mass" is much clearer than "Graph II - Force *vs.* Acceleration". Subtext should appear immediately below the graph, and in a smaller point size, and is where you should have a brief summary of what the reader is looking for in the graph. In other words, a description of why it is in the paper in the first place. The graph and summary allow it to be a stand-alone item in the paper that can be taken out of context but still be clearly understood.

**Tables** – Tables should ALWAYS have a title that clearly identifies the contents and purpose of the table. Each column of the table should be labeled with a title and meaningful units and have correct significant figures. Tables should be used only if they are referenced in support of the content of the paper. As with the graphs, immediately below the table, and in a smaller point size, you can have a brief sub-text summary of what the reader is looking for in the table. In other words, a description of why it is in the paper in the first place. The table and summary allow it to be a stand-alone item in the paper that can be taken out of context but still be clearly understood. Tables should not cross page boundaries if possible. **If a table must cross onto a second page, then the title (with a *continued* added to it) as well as the column labels must be reproduced.**

**DISCUSSION AND CONCLUSIONS** - Recall that you wrote the paper with a specific purpose in mind. This element of the paper is a summary statement of your work, with supporting arguments. Think of it as the TLDR version of the paper (Too Long Didn't Read).

**STYLE GUIDELINES** – There are a few stylistic elements that you will need to follow. When using latin, you should use an italic font (*e.g., i.e., via, et cetra, et al., ...*). The latin abbreviations *e.g.* and *i.e.* should be followed by a comma (*e.g., this text is the expected proper usage*). Equations should have the same point size as the rest of the text. The word “data” is plural, so the correct usage is “data were”, “data are”, *etc...*

On the following page are the most common issues I find when I am evaluating student work. I have a short hand to identify the issues. I strongly recommend that you read through you paper looking for these specific issues.

## PROOFING MARKUP

AWK – The wording is awkward (similar to PW).

BH – Broken Header. You spanned a table across pages and did not reproduce the header on the second page. This markup also applies when a table or figure header is the last line on a page and the table or figure is on the next page, or a section title is orphaned.

EP – Your sentence ends in a preposition. (1 point for each occurrence unless it ends in the word “at” in which case it is 2 points)

IP – Inanimate possessive. Inanimate objects cannot own things. State "the volume of the washer" rather than "the washer's volume". (2 points for each occurrence)

ITL – *italic*.

DP – Demonstrative Pronoun. Do not use demonstrative pronouns in the lab report. The constructs THIS and THAT (and their plurals) shall **only** be used as demonstrative adjectives which require a qualifying noun (*e.g.*, these data, this result, *etc.*). (5 points off for each occurrence).

PW – Poor wording. Similar to AWK. (come see me for the details).

REP – Repetitive. Reword to consolidate your thoughts.

SSP – You have a single sentence as a paragraph. (3 points off for each occurrence)

WO – Widow and orphan control. An orphan is when a single line of text, all alone, is the last line on a page and is also the first line of a paragraph. A widow is when the last line of a paragraph is the first line on a new page.