ME 360
Formal Lab Reports

Objective(s)
- One or two sentences describing the "what" of your report.
- Describe the purpose of the laboratory exercise.
  - What are the lab exercises trying to do?
  - Be specific - not vague!
- Do NOT say the purpose was to “introduce the student to ...”

Background
- Gives information necessary to understand and appreciate the report.
  - Relate your efforts to previous work done in the field ("why is this important to an ME?")
  - Briefly describe the engineering theory used
    - Show or derive theoretical equations used, giving the references for uncommon equations
    - If you did not know the equation before ME 360, then it is uncommon!
    - Do not use the ME 360 course manual as a reference for ANY equations

Experiment
- A description of the experimental setup
  - a brief description of the experimental procedure, but not a "cookbook recipe,"
  - descriptions of all test equipment used,
    - "make and model" (M&M)
  - dimensions of beams, weights of masses, component values in op-amp circuits, etc.,
  - diagrams (sketches or schematics) showing all relevant dimensions and/or component values.

"Annotated" Digital Photos

Experiment
- The "Experiment" section focuses on the "how" of your lab experience
  - Write in the past tense, since it has already been done
- Do not duplicate the "Background" section - which contains general truths
- DO NOT present the raw data collected in the lab in the Experiment section!
  - it belongs in the Appendix!
Results and Discussion
► Present in concise terms the significant results of the effort in words, tables, and figures:
  ▪ comparison of experimental results to theory,
  ▪ uncertainties in measurements and their impact on results, and
  ▪ analysis of major sources of error (if any) in your experimental technique

► Address any questions specifically asked in your lab handout
► All tables and figures must be discussed in the text.
► Dimensions of beams, weights of masses, etc. are NOT Results!

Conclusions
► Should be a short paragraph that restates the major results using numerical values when possible, and interpretations of those results.
  ▪ Were the objectives of the lab met?
  ▪ What can you conclude from the lab?

Recommendations
► Not used in ME 360 lab reports

References
► Any material taken directly from another author must be given proper reference.
► You may NOT reference your ME 360 course manual for any equations or pictures!
  ▪ you can use the manufacturer's data sheets for the back of the course manual, but you don’t reference these
► Minimum of 3 references required for each formal lab report

Appendix
► Appendices generally contain supporting material including
  ▪ index / table of contents (typewritten!)
  ▪ raw data sheets,
  ▪ sets of sample calculations,
  ▪ uncertainty calculations
► All material in the appendices must be specifically mentioned in the main text at some point.
  ▪ May be neatly hand-written!
**Nomenclature (List of Symbols)**

- Do not use a "Nomenclature" section in ME 360 lab reports.
- Must define symbols in text after they are first used:
  
  "Mechanical output power is calculated from the formula
  
  \[ P = \tau \omega \]
  
  where \( P \) is the power (typically horsepower or watts), \( \tau \) is the torque (typically ft-lbf or N-m), and \( \omega \) is the angular velocity in RPM (revolutions per minute)."

**APA Style**

- Use the APA style for ME 360 & ME 460 lab reports
  
  - a few modifications specifically noted in the Technical Writing handout

- Many websites discuss APA style and give examples—consult them if you have questions.

**Nomenclature (List of Symbols)**

**APA Style - see “Good Lab”**

- Title page format
- Header format
  - All pages numbered, starting at 1 on title page
- Heading format (Objective, Background, ...)
- Fonts and text spacing
  - 12 pt Times New Roman in text
  - 12 pt Arial in figures (Excel's default font)
  - Double space all text - allows comments

**APA Style - see “Good Lab”**

- Table title and Figure caption format
  - ME 360/460 use centered captions, not APA left-justified style
  - See examples in Technical Report Writing section and “Good Lab” for APA-style table formatting
  - English grader checks these carefully!
- References
  - Cite references in text
    - Minimum of 3 references required in ME 360
    - Nothing from ME 360 lab handout or course manual counts towards these three
    - List references at end of report

**Formal Lab Reports**

*DUE AT 8:00 AM ON THURSDAY THE WEEK AFTER LAB:*

- One complete printed report (for ME instructor)
  - Report with appendix (staple in upper left hand corner as one unit)
- Electronic copy of report
  - On CD, floppy or e-mailed to Dr. Parker
    - Delete photos and plots to reduce file size
- One printed report (for English grader)
  - Report only - no appendix

**Figures**

- You may not use figures taken directly from the course manual or lab handout in your lab report
  - Unless they are posted on the ME 360 web site
  - Reference any figures used from ME 360 web site, but does not count toward the 3 reference minimum
- All figures must be numbered and must have a caption,

  *Figure 1. Experimental set-up.*

- Use Figure - not Chart - for plots
Plotting Data

► Frequently need to plot experimental and theoretical data together
  ▪ visual comparison of how close the two match
► Experimental data frequently has uncertainty
  ▪ theoretical data based on measured values will also have uncertainty
► Uncertainty plotted as error bars in Excel
► When experimental and theoretical data are close, often best to plot the difference between them also

“Wrong”

“Good”

“Better”

“Best”

Plotting in Excel

► See the tutorials at
  http://www.me.ua.edu/me360/docs/Excel-WhatToKnow/KnowInExcel.htm
Low Pass Filter

![Low Pass Filter Graph](image)

**Figure 6.**