2.672: Writing a technical paper

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Elements of a technical paper

• Title
• Abstract
• Introduction
• Theoretical background
• Apparatus and procedure
• Results and discussion
• Conclusions
• Nomenclature (optional)
• References
• Appendices (optional)
2.672 writing

• Individual reporting
  – You share ideas, data and results with your group members. You need to write your own project report though.

• Writing style
  ➢ Avoid subjective comments, and use of personal pronouns; use passive voice instead
  ➢ Write directly, avoid words that are not useful such as:
    ▪ “In order to”
    ▪ “the purpose of this experiment is to”
  ➢ No. of significant figures in numbers should reflect accuracy of measurement
Paper versus report

• Report
  – Usually for internal use
  – Document details of the project for archival purpose
    ➢ Include details: drawings, computer programs

• Paper
  – For external audience
  – Succinct and to the point
    ➢ Do not need to write about routine details such as calibration procedure etc.
    ➢ Do not put computer program listing in a paper
The title is what draws reader to your work
- Reveal the topic of the paper
- Should include key words about the project

Make the title interesting and attractive
Abstract

• Brief condensation of the paper
  – 150 – 200 words
  – Do not explain why the study is done in the abstract
• What was done?
• How was it done?
• What are the significant results
Introduction

• Introduces subject
  – Background and context
  – Articulate the need for the study
  – Clearly define the problem (purpose of the investigation)
  – Briefly outline overall approach
Theoretical background

(Should use a more meaningful heading than theoretical background)

• Physical explanation of the phenomena involved
• Develop governing equations
  – Assumptions: support them quantitatively
    ➢ e.g. laminar flow — give Re
  – Describe model development
    ➢ Give the key equations only; put details in the appendix
• Connect your theory to your project
  – What theoretical values are to be compared to experimental results?
Apparatus and procedure

• Overview of operation
  – Refer to a schematic to explain the operation
  – Give dimension of apparatus
    ➢ Relationship between the laboratory device and the real device
  – What are being measured?
    ➢ Do not need to give details about transducers if they are common devices

• Experimental matrix
  – What are the variables and what range has been covered?
Results and discussion

Results

• Use figures
• Describe the direct observation first (e.g. pressure vs. time)
  – Point out the features and the physics behind them
• Show how do the results change when you change the variables of the experiment
  – Magnitude (up or down; by how much?)
  – Trends and scaling laws
    ➢ linear, exponential, …
Discussion

• Does theory produce the same features as the observations?

• Plot theoretical values on the same graph as the experimental results
  – Explain the differences

• Make the results (theory and experiment) **useful**
Conclusions

• Summary of your finding
• Pronounce your judgment
  – What are the key parameters?
  – How are the results related to these parameters
  – How good is your model? What does it capture?
  – How does your study contribute to the objective stated in your introduction?
Appendices

• Details that your reader may not need to follow the overall picture but are required to support your work
• Need have narrative to describe any equation, table, or graph in the appendix
Further remark: graphs

- Caption should be short but informative and comprehensive
- Axes should be labeled
  - For dimensional quantities, units are required
  - Use symbols for data points and lines for theoretical values
  - For multiple curves, mark each curve clearly