

# **Machine Design**

**MOW 323**

**2003**

**Reading, Writing and Presentations**

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# Writing in Engineering

This manual contains information to assist you in improving your academic and scientific communication skills. Special attention is given to academic and scientific writing skills. We refer to these activities as writing-to-learn and learning-to-write in engineering. Why do you need to write?

The immediate value of writing is a better understanding of the subject material. The process of finding, analysing, organising and presenting information is an invaluable aid to learning. Writing is an excellent way of helping you crystallise your ideas and coherently express your understanding of a subject. So, the process of writing an assignment, painful as it may seem at times, helps a student understand and integrate new information and material. Needless to say, understanding the subject material will benefit your final grades!

Taking a broader view, writing to learn will help develop your ability to think intensely and productively for longer and longer periods. In addition, by completing the various writing assignments, you will become a better writer, a better communicator. Learning to convey information on paper in a clear and professional manner is part of your training for a career as an engineer. Do not underestimate the importance of this benefit: the ability to communicate is one of the most important attributes employers look for in job applicants.

Furthermore, the Engineering Council of South Africa (ECSA) requires that engineering graduates must demonstrate, amongst others, *an ability to communicate effectively, both orally and in writing, with engineering audiences and the community using appropriate structure, style and graphical support.*

In this manual aspects are addressed that will assist you in the knowledge and skills needed for academic and scientific writing and also for the writing that you will eventually have to do as an engineer. Please keep this manual for future references.

## **Section A: Writing Guidelines**

## Common mistakes in English

### 1 General

Do not use an American dictionary to spell check a document.  
 Use the "-ise" spelling instead of "-ize".  
 Use the following word order: subject-verb-indirect object-direct object



### 2 An or a?

**An:** For words beginning with a e i o u; silent h; single letters a e f h l l m n o r s x  
**A:** For all other words; single letters b c d g j k p q t u v w y z

### 3 Concord (agreement of subject and verb)

I:	am/was/have/shall	play/eat	We:	are/were/have/shall	play/eat
You:	are/were/have/will	play/eat	You:	are/were/have/will	play/eat
He, she, it:	is/was/has/will	plays/eats	They:	are/were/have/will	play/eat

Noun nearest to verb is used when:

- Either ... or
- Neither ... nor
- Not ... but
- Not only ... but also

e.g.: Neither the lecturer nor the students *are* ill.

The first noun is used when:

- With
- Together ... with
- As well as
- Including

e.g.: The lecturer as well as the students *is* ill.

Quantities and collectives take the singular verb *is/was*:

*x* tons; *x* litres; *x* metres; R2000; series; public; furniture; news; mathematics

### 4 Singular & Plural

Singular nouns:	Plural nouns:
Criterion	Criteria
Datum	Data
Stratum	Strata
The number of	A number of



**5 Vocabulary**

<p>affected by / the effect of                  extent of / extend the (extent is a noun; extend is a verb)                  Fewer numbers but less quantity                  Owing to (=because of) / due to (=caused by)</p>
--

**6 Prepositions**

<p>Aim <i>at</i>  <i>under</i> the circumstances                  complain <i>of</i>                  compliment <i>on</i>                  different <i>from</i>                  disqualified <i>from</i>                  divide <i>by/into</i>                  exception <i>to</i>                  exchange a – <i>for</i> a –  <i>in front of</i></p>	<p>move <i>into</i>                  multiply <i>by</i>  <i>within</i> a time period  <i>for</i> a period of time                  place <i>onto</i>                  reaction <i>to</i>  <i>in respect of</i>                  succeed <i>in</i>                  surprised <i>at</i></p>
--	--



**7 Usage**

<p>Use the following:                  percentage                  performed; investigated                  researchers, professionals                  several, various                  x metres long</p>	<p>rather than:                  percent                  done                  persons                  a number of                  x metres in length</p>
---	--

**8 My personal reminders:**

## Some tips on English usage

### 1 Linking words together

Refer to the *Oxford Advanced Learner's Dictionary* **Language study pages**.

### 2 A sentence

The structure of a simple sentence: *The dog bit the man.*  
subject-verb-object



Sentences are made up of clauses; there are just five clause elements, namely, **subject**, **verb**, **object**, **complement** and **adverbial**:

(**s**) The teacher / (**v**) has called / (**o**) me / (**c**) a genius / (**a**) several times.

Keep your sentences short.

### 3 A paragraph

A paragraph is a visual unit.

It is separated from the rest of the text by being indented at the beginning or by an open line between it and the next paragraph.

A paragraph is also a thought unit. Each paragraph develops one main idea in a number of related sentences. To find the main idea or topic or subject, we ask "What is this paragraph about?"

The topic or main idea of a paragraph is usually stated in one of the sentences of which it is composed. This sentence is called the *topic sentence*.

By far the most common position for this topic sentence in a paragraph is at the beginning, but it is not always the case.

Sometimes a paragraph does not have a topic sentence. However, there is usually one main idea that you can state by formulating your own topic sentence.

### 4 Our motto when writing English:

When in doubt, consult your dictionary!

Recommended dictionary: *Oxford Advanced Learner's Dictionary* (6<sup>th</sup> Edition)

This dictionary has very useful sections **Language study pages** and **Appendices** covering various aspects concerning English usage.

## Hints for compiling professional documents

### 1 How to type some special characters

ë NumLock Alt 0235	ï NumLock Alt 0239	ö NumLock Alt 0246
ê NumLock Alt 0234	ì NumLock Alt 0236	õ NumLock Alt 0246
é NumLock Alt 0233	í NumLock Alt 0237	ô NumLock Alt 0244
è NumLock Alt 0232	î NumLock Alt 0238	ó NumLock Alt 0243
	ü NumLock Alt 0252	
	û NumLock Alt 0251	

### 2 Rules of Thumb for document handling

1. Use a suitable document template.
2. Check the page setup.
3. Work in Print layout view: View → Print Layout
4. Work with the ruler on: View → select Ruler
5. Set the measurement units to centimetres: Tools → Options → General → Measurements units
6. Work with the spell checker on: Tools → Options → Spelling and Grammar.
7. Work with the grammar checker on: Tools → Options → Spelling and Grammar.

Heed the automatic spelling and grammar checks and follow them up. In MSWord spelling mistakes are indicated by RED zigzag underlining and grammar errors by GREEN zigzag underlining. However, take note of *A word of caution when using a spell checker* below!

8. A zoom factor of 80% is convenient for reading and seeing the left and right ends of the page.
9. Once you've started with a document, **save** it. Use a descriptive filename – it makes finding the file easier when you have to search for it.
10. **Never work on a stiffy.** Use the Explorer to transfer the file to the hard disk, work and save on the hard disk and then use the Explorer to transfer the file to the stiffy if you need to 'travel' with it.
11. To identify a document, add a **footer** (in a small font) with the name of the document on a first line. On the next line, indicate when and by whom the document was compiled, e.g.:  
Hints.doc  
Compiled on 2003/07/15 by T Steyn
12. Always do a **Print Preview** before you print
13. Compile your own notes on document handling – it becomes a useful personal resource.

### 3 Rules of Thumb: Word Processing is not Typing

If you're already a touch typist, your typing skills will help you become proficient at word processing quickly. Unfortunately, a few typing skills are counterproductive on a modern word processor. Here's a short list of new word processing habits to replace outmoded typing habits:

- **Use the Return/Enter key only when you must.** Let the computer's automatic word wrap handle routine end-of-line business.
- **Use tabs and margin guides, not the space bar, to align columns.** WYSIWYG is a matter of degree, and text that looks perfectly aligned on screen may not line up on paper if you depend on your eyes and the spacebar.
- **Don't underline.** Use *italics* and **boldface** for emphasis.
- **Use only one space after a period.** Type experts agree that proportionally spaced fonts look better if you avoid double spaces.
- **Take advantage of special characters.** Bullets (•) and other non-typewriter characters can make your work look more professional.

## 4 Rules of Thumb: Beyond DESKTOP TACKY

Many first time users of WYSIWIG word processors and desktop publishing systems become intoxicated with the power at their fingertips. It's easy to get carried away with all those fonts, styles, and sizes and create a document that makes supermarket tabloids look distasteful. While there's no substance for a good education in the principles of design, it's easy to avoid tacky looking documents if you follow a few simple guidelines.

- **Plan before you publish.** Design (or select) a simple, visually pleasing format for your documents and use that format throughout the document.
- **Use appropriate fonts.** Limit your choices to one or two fonts and sizes per page, and be consistent throughout your document. Serif fonts like this one generally are good choices for paragraphs of text; the serifs gently guide the reader's eye from word to word. Sans serif fonts, like the headings in this manual, work well for headings and titles. Make sure all your chosen fonts work properly with your printer.
- **Don't go style-crazy.** Avoid overusing italics, boldface, underlines, and other styles for emphasis. *When in doubt, leave it out.*
- **Look at your document through your readers' eyes.** Make every picture say something. Don't try to cram too much information on a page. Don't be afraid of white space. Use a format that speaks clearly to your readers. Make sure the main point of your document stand out. Whatever you do, do it for the reader.
- **Learn from masters.** Study the design of successful publications. What makes them work? Use design books, articles, and classes to develop your aesthetic skills along with your technical skills. With or without a computer, publishing is an art.
- **Know the limitations of technology.** Study Desktop publishing technology makes it possible for everyday people to produce high-quality documents with minimal investment in time and money. But today's technology has limitations; for many applications, desktop publishing is no match for a professional design artist or typesetter. If you need the best, work with a pro.
- **Remember the message.** Fancy fonts, tasteful graphics, and meticulous design can't turn shoddy ideas into words of wisdom or lies into the truth. The purpose of publishing is communication; don't try to use technology to disguise the lack of something to communicate.

## 5 A word of caution when using a spell checker

### *The Spell Checker*

Eye have a spelling checker  
 It came with my pea sea  
 It plainly marks for my revue  
 Miss stakes eye kin not sea.  
 Eye strike a key and type a word  
 And weight for it two say  
 Weather eye am wrong or write.  
 It shows me straight a weigh.  
 A soon as a mist ache is maid  
 It nose bee fore two long  
 And eye can put the error rite.  
 Its rear lea ever wrongs.  
 I have run this poem threw it  
 I am shore your pleased two no  
 Its letter perfect awl the weigh  
 My checkers told me sew.

*Source unknown.*

Sections three and four above were adapted from:

Beekman, G. 1994. *Computer currents – navigating tomorrow's technology*. Redwood City: The Benjamin/Cummings Publishing Company.

# Writing report and papers in Engineering

## 1. Introduction

A report is the formal writing up of a piece of research or project work. Reports are usually written up in a concise style giving precise detail. A research paper refers to a written journal article or to a contribution made at a conference. The latter usually comprises a written document that is published in the conference proceedings and which is also presented orally at the conference.

Most of the writing done by engineers consists of reports and papers. The purpose of these is to transfer information to the reader. Different readers will have different requirements from a report or paper. A managing director will probably not have time to read the report but will be interested in the most important results and recommendations. Somebody paging through a technical journal needs to establish quickly if a paper is of importance to him/her. Once this has been determined, the reader may be interested in checking the information in the finest detail: What was done? How was it done? What is the result?

Novice technical writers usually experience problems with the structure (format) of their writing and with meeting the demands of accuracy, brevity and clarity.

The following guidelines aim to prescribe a structure for writing technical reports and papers and to assist you by detailing the exact requirements of the different sections of a report/paper. During your further studies, your department may have some specific additional requirements that you will have to adhere to.

## 2 Format for reports and papers

Papers and reports typically consist of the editorial information, an introduction, a literature survey, the methodology followed, the results and a discussion thereof, the conclusions, recommendations and a reference section. Appendices are only added if necessary. Typical formats for reports and papers are outlined in Table 1 and Table 2 respectively.

**Table 1: Format for reports**

**Table 2: Format for papers**

Editorial information Title page Summary & keywords Acknowledgements Contents List of tables List of figures Nomenclature list (Symbols)	Editorial information Title Author(s) Abstract & keywords Nomenclature list (Symbols)
1. Introduction 2. Literature survey (Theory) 3. Method 3.1 Experimental design 3.2 Apparatus 3.3 Experiments 4. Results (or Results and Discussion) 5. Discussion 6. Conclusions (or Conclusions and Recommendations) 7. Recommendations 8. References 9. Appendices	1. Introduction 2. Theory (Literature survey) 3. Method 4. Results (or Results and Discussion) 5. Discussion 6. Conclusions (or Conclusions and Recommendations) 7. Recommendations 8. Acknowledgements 9. References 10. Appendices (seldom used)

### 3 Page layout of a report

For a lengthy report and if you want to make a good impression, use a suitable cover for your report.

Title page	No page number
Next page: Summary and keywords	Page numbering in small roman numerals ( <b>start at iii</b> )
Next page: Acknowledgements	Continue page numbering in small roman numerals
Next page: Contents <sup>#</sup>	Continue page numbering in small roman numerals
Next page(s) <sup>#</sup> : List of tables <sup>#</sup>	Continue page numbering in small roman numerals
List of figures <sup>#</sup>	
Nomenclature list <sup>#</sup>	<sup>#</sup> For short reports with a limited content list, you can continue with the list of tables, list of figures and nomenclature list on the same page.

Next page: Continue with the rest of the report.

- |                      |   |
|----------------------|---|
| 1. Introduction      | Page numbering in small Arabic numerals ( <b>start at 1</b> ) |
| 2. Literature survey | Continue page numbering in small Arabic numerals.             |
| 3. Method            |   |
| 4. Results           |   |
| 5. Discussion        |   |
| 6. Conclusion        |   |
| 7. Recommendations   |   |
| 8. References        |   |
| 9. Appendices        |   |

### 4 Page layout of a paper

The layout of a paper differs significantly from that of a report. Furthermore, a specific journal or conference usually requires a specific layout. However these requirements are broadly speaking usually structured according to the following layout.

A paper does not have a cover page.

Page 1 is the title page and comprises:

- |   |   |
|---|---|
| Title (centred)   | Number the pages in small Arabic numerals ( <b>start at 1</b> ) |
| Names of the author(s)  |   |
| Company of affiliation  |   |
| Contact detail of author to whom correspondence must be addressed |   |
| A heading <b>Synopsis</b> or <b>Abstract</b> (left justified)     |   |
| A heading <b>Keywords</b> (left justified)                        |   |

Page 2: Nomenclature list (if given), followed directly by

- |                              |  |
|------------------------------|--|
| 1. Introduction              | Heading  |
| 2. Literature survey         | Continue page numbering small Arabic numerals. |
| 3. Method                    |  |
| 4. Results                   |  |
| 5. Discussion                |  |
| 6. Conclusion                |  |
| 7. Recommendations           |  |
| 8. References                |  |
| 9. Appendices (if necessary) |  |

**Page numbering:** Note that the pages of a paper are numbered from the title page using Arabic numbers. Headings are not necessarily numbered. If the headings are numbered, the number 1 is assigned to the Introduction.

## 5 Headings and numbering

Use a decimal numbering system for headings and subheadings. Avoid subdivisions with more than four digits, e.g.:

1. Introduction
2. Heading for the second section
  - 2.1 First subheading
    - 2.1.1 point one under subheading 2.1
    - 2.1.2 point two under subheading 2.1
      - 2.1.2.1 point one under 2.1.2
      - 2.1.2.2 etc.
  - 2.2 Second subheading
    - 2.2.1 point one under subheading 2.1
    - 2.2.2 etc.

Tables and figures must be numbered and labelled.  
Captions are generally given below the table/figure, e.g.:

5.1.0.1 Institution	Car no	Mass (Kg)	Acceleration (m/s <sup>2</sup> )	Top speed (km/h)	Hill climb (s)	Endurance (laps)
Potch Univ	3	230	5.94	32.03	14.43	75
RAU	4	192	4.92	41.96	0	49
Techn Pretoria	5	171	5.64	44.96	12.57	34
UCT	6	164.5	4.62	40.36	11.75	22
RAU	7	172	8.46	27.11	0	2
UCT	9	179	5.20	42.25	15.62	55
Tuks	11	171	5.01	43.69	11.26	85
Wits	26	146	4.23	47.75	9.65	40

**Table 1** Mini Baja 2000 competition data



**Figure 1** Example of a Mini Baja car

**Note:** Be consistent with the format of your numbering and labelling system throughout your paper/report.

## 6 Requirements for the different elements of a report/paper

### 6.1 Title

The title of either a report or a paper is a short, informative description of the investigation. It must be unambiguous, free of all unnecessary words, but must contain the important keyword describing the investigation. Many technical journals limit the title to 15 words.

### 6.2 Editorial information

**For reports adhere to the following:**

- **Title page.** The title of the report, the name(s) of the author(s), as well as additional information like the name of the institution, company or authority (under whose name the report is published) and the date. For university reports your student number, the course name and code also have to be given. The information on the title page must be arranged so as to create a balanced and professional impression.
- The **summary (synopsis)** should enable the cursory reader to find out immediately what the scope of the investigation, the main findings and recommendations (if any) are. If a translated synopsis is also given and they do not fit on one page, the translated synopsis must start on a new page. **Keywords** appear immediately after the synopsis (see paragraphs 6.3 and 6.4 below).
- If the author wishes to thank persons or organisations, this is done on the following page under the heading **acknowledgment(s)**.
- **Contents.** The table of contents must display an accurate account of the contents. The number of each section, heading of each section and the page number on which it appears must be shown.
- **List of tables.** The list must display each table giving the number of the table, the caption of the table and the page number where it appears.
- **List of figures.** The list must display each figure giving the number of the figure, the caption of the figure and the page number where it appears
- **Nomenclature list.** All symbols that are used in the report must be given and defined and where applicable units must also be given. Greek characters, subscripts and superscripts are tabulated separately.

**For papers (journal articles or conference contributions) adhere to the following:**

**Title page:**

- The title in a larger (maybe different) font.
- Name(s) of author(s), company affiliation(s) and address of the author to whom correspondence must be addressed.
- A synopsis (abstract) in English of (usually) 100-200 words.
- Keywords (on the same line) that identify the paper.

### 6.3 Synopsis (abstract)

The synopsis is a concise summary of the report. The synopsis should be formulated in such a way that you provide the answers to the following questions without stating the questions explicitly:

What was done in the research (objective of the research).

Why this research was done (motivation for the research).

How the research was done (method of investigation).

What the outcome was (results).

What the conclusion(s) is (are).

## 6.4 Keywords

Keywords are used in information retrieval systems. During a subject search, papers with a certain keyword or combination of keywords are selected. You have to select a maximum of five words that distinctly characterise the content of the report.

## 6.5 Introduction

The purpose of the introduction is to put the reader in the position where the author was before he/she started the investigation.

The following usually appear in the introduction:

- Background
- Problem statement
- Purpose of the investigation
- Method (very briefly), scope and/or limitations

**Background information** is necessary to orientate the reader regarding the context of the report.

The **problem statement** outlines the motivation for the investigation. For example:

The feasibility of a filtration technique to purify a locally available raw material containing potassium was investigated. This investigation was necessary because of a shortage of potassium for the manufacturing of explosives.

The **method, scope and limitations** are mentioned only. Only a few sentences are required to cover this. Further details are then given in the body of the report. For example:

The efficiency is determined experimentally in a laboratory scale investigation. Because of compressed air limitations, the investigation is limited to 300kPa.

or

The number of swimming pools in the Pretoria municipal area was determined from aerial photographs. Indoor pools are, therefore, not included in the report.

## 6.6 Theory or literature survey

A section on literature is included if more comprehensive background is required than can conveniently be given in the introduction. This background will include information of which the reader is probably not aware and which is required to understand the report, to justify the investigation and to follow arguments and mathematical models or expositions. A literature survey **must** be given in all project reports, laboratory investigations and dissertations.

It is totally undesirable to rewrite major portions of a textbook or a laboratory guide or to give detailed derivations of equations. Show only a summary of the current state of the art. Referencing must be used to indicate the source of each statement or data and each equation or derivation used in the literature section.

The literature survey of a paper will be less comprehensive than for a full report. It should, however, always convince the reader that the investigation was justified and that the method of investigation was guided by the existing level of knowledge on the subject.

## 6.7 Method

**For reports adhere to the following:**

In reports the planning, apparatus, and experimental methods are described in some detail. These can be included in one paragraph or each can be assigned a separate paragraph. The descriptions and/or references must be complete enough to enable the reader to repeat the experimental work.

- **Planning**  
Name the independent variables and motivate the choice. Motivate the range of values investigated for the independent variables used. Show and motivate the choice of dependent (or measured) variables. Show the experimental design. In your further study you will need to consult good books on experimental design.
- **Apparatus**  
Describe the apparatus used. Use sketches and give dimensions if necessary. Give equipment type and model number etc.
- **Experimental procedure**  
Describe the methods used in the experimental work and analysis. Use references freely; also references to standard methods and techniques pertaining to your field of study.

### **For papers (journal articles or conference contributions) adhere to the following:**

The method section in a paper is as brief as possible, but it must still be informative. In many cases the three sections (planning, apparatus and experimental procedure) will be combined. Less detail will be given and referencing will be generous – often to the full report on which the paper is based.

## **6.8 Results**

Report the most important results first unless this would impede the logic and flow of the argument. Use graphical and tabular presentation judiciously. Indicate important points to the reader. It often makes more sense to report the results and immediately discuss their significance. In such instances change the heading to: **Results and Discussion**. The separate discussion section will then be omitted.

In **reports**, illustrate data manipulation using complete sample calculations. If it is feasible (for example in laboratory reports) sample calculations are placed in the text. In reports in practice, sample calculations are placed separately in an appendix and referred to in the text. In the case of large projects, make meaningful subdivisions so that results do not disappear in the variety of data, calculations, etc.

In **papers**, data manipulation and sample calculations are not shown. If necessary the original report is referenced. It may be necessary to describe briefly how the observed values were manipulated to arrive at the information presented.

## **6.9 Discussion**

The results of most technical reports are in the form of correlations between different variables. The correlations must be explained using acceptable theories and mechanisms. It is strongly recommended that you also use appropriate graphical representation to visualize relationships between variables. You must **always** use the X-axis (horizontal axis) for the independent variable.

In case of research projects new theories or mechanisms must be formulated. From the viewpoint of the project leader's evaluation, this is a very important section. It gives an indication of the author's insight into the problem.

## **6.10 Conclusion**

This section is a resumé of all the conclusions already drawn in the discussion section. There will consequently be repetition. The most important conclusions must be mentioned first, unless this leads to bad logic or loss of argument. Note that no new material, information or results may be introduced at this point. All the conclusions must flow from the aims and purpose of the investigation as stated in the introduction.

## 6.11 Recommendations

Findings may lead to actions that should be considered. The recommended actions are summarised as recommendations. All recommendations must be motivated from the conclusions. Do not include recommendations in the heading if there are no real recommendations to be made. If the scope of the recommendations do not justify a separate heading, the recommendations can be combined with the conclusions in the same section.

## 6.12 References

References should not be confused with headings like "Bibliography" or "Further reading".

All references **must** have been referred to in the text.

### 6.11.1 General remarks on references

With the exception of generally known facts, all statements that are not your own must be provided with a reference. Never create the impression that ideas, arguments, facts or conclusions are your own unless it is true. Plagiarism is a serious academic felony. References are typically used to:

- Justify statements and findings;
- enable the reader to consult the original source and
- acknowledge the author(s) for a specific contribution.

Consult the original source as far as possible, since it will usually contain the most accurate account of the findings and limitations of a certain study. If, however, this is not possible or if the source is not available, clearly indicate that you quoted from another person's work (see Reference Methods below).

### 6.11.2 Reference methods

Reference styles may vary amongst different academic departments, journals and conference proceeding. Whichever style you use, be consistent.

### 6.11.3 References in text

Note the following cases for in line citations.

- (i) Author (1999) has found that tobacco contains more than 2000 harmful chemicals.
- (ii) It has now been found that tobacco contains more than 2000 harmful chemicals (Author, 1999).
- (iii) A direct citation: *Tobacco contains more than 2000 harmful chemicals* (Author, 1999:pg nr).

### 6.11.4 References in the reference list

Refer to Section E of this manual. Note that the articles use different reference systems. In the conference paper by Horak, Steyn and De Boer the Harvard reference style is used. In the journal article by Van Rensburg, Steyn and Els the reference style is generally used for scientific report writing in engineering.

When compiling a research document, you will have to use the specific reference style as required by the supervisor, the journal or the conference proceedings.

All styles of references include the following information regarding the source:

Name(s) of author(s), title (of book, article, presentation, etc.), publisher's details, place of publication, year of publication.

Note that the specific format is very important for the style used and it must be used consistently. Take special note of the use of colons, commas, full stops and italicised text. **You must always use the format as prescribed meticulously.**

### 6.11.5 References in the reference list according to the Harvard reference style

#### 1. References to books with one author:

Author, A.B. 1999. *Name of book*. (2<sup>nd</sup> or later edition). Place of publication: Publisher.  
e.g.: Herrmann, N. 1995. *The creative brain* (2<sup>nd</sup> edition). U.S.A.: Quebecor Printing Group.

#### 2. References to books with more than one author:

Author, A.B. & Author, B.C. 1999. *Name of book*. (2<sup>nd</sup> or later edition). Place of publication: Publisher.  
e.g.: Lumsdaine, E. & Lumsdaine, M. 1995. *Creative problem solving – thinking skills for a changing world*. Singapore: McGraw-Hill.

#### 3. References to chapters/articles in books:

Author, A.B. 1999. Title of chapter/article in the book. In: Author, C. & Author, D. (Eds.) *Name of book*. (2<sup>nd</sup> or later edition). Place of publication: Publisher.  
e.g.: Park, K. & Travers, K.J. 1996. A comparative study of a computer-based and standard college first-year calculus course. In: Kaput, J.J., Schoenfeld, A. & Dubinsky, E. (eds). 1996. *Research in collegiate mathematics education II*. Washington: Mathematical Association of America.

#### 4. References to articles in journals:

Author, A.B. 1999. Title of article. *Name of journal*, Volume(number):pages.  
e.g.: Gazzaniga, M.S. 1998. The split brain revisited. *Scientific American*, 279(1):35-39.

#### 5. References to newspapers:

Author, A.B. 1999. Title of article *Newspaper*. Day Month:page.  
e.g.: Ramphela, M. 1998. South Africa must invest in its intellectual capital or pay the price later. *Sunday Times* 24 May:24.

#### 6. References to reports:

Author, A.B. & Author, B.C. 1999. *Title of report*. Organisation. Type of report, report number. Place.  
e.g.: Du Plessis, I. 2001. *Five Year Study Programme Annual Report 2001*. Pretoria: University of Pretoria.

#### 7. References to dissertations/theses:

Author, A.B. 1999. *Title of thesis*. PhD-thesis. Place: Organisation.  
e.g.: Steyn, J.L. 2002. *Hydraulic amplification for actuation in MEMS*. Masters Dissertation. Boston: Massachusetts Institute of Technology.

#### 8. References to personal communications:

Author, A.B. 1999. Personal communication with - write your own Initials and Surname.  
e.g.: Sandenbergh, R.W. 2003. Personal communications with B.C. Mathibe.

#### 9. WWW references:

Author, A.B. 1999. *Title of the article*.  
www address in full (Accessed on Day Month 1999).  
e.g.: Pritchard, T. 2001. *The return of steam*.  
<http://www.industry.gov.au/resources/netenergy/aen/aen21/19steam.html>  
(Accessed 7 July 2003).

## 6.13 Appendices

### Reports

The previous sections form the core of the report. A good reporter will arrange them to form a logical overview of the project. To achieve this, it is usually necessary to exclude raw data, cumbersome calculations, supporting results (for example standardising of equipment) and documentary material (e.g. graphs used in calculator and computer programs) from the main body of the report. Such material is then put in appendices as appropriate paragraphs and subparagraphs. Only one aspect is treated per appendix. Each appendix is provided with a number and descriptive heading and is indicated by page number in the table of contents.

Appendices should not contain unedited graphs, tables or figures. The symbols and language used in the appendices must be the same as in the rest of the report. If computer programmed results are used in appendices, these must preferably be in the same letter type as the rest of the report. Printouts of, for example, statistical data, must be edited (or retyped) to eliminate unnecessary information and undefined variables.

### Papers

Only in exceptional cases will a paper contain an appendix. Such an appendix should preferably not be more than one page and will not necessarily start on a new page.

# Important notes for writing reports in Engineering

Keep the following guidelines in mind when writing scientific reports.

## 1 Layout

- Use a logical system of headings and subheadings. Use a hierarchical report structure, but be careful that this will not cause the report to become unwieldy (clumsy). Be especially careful of using multiple levels of paragraphs and sub-paragraphs.
- Keep sections short.
- Where possible, place long lists of facts in tables rather than in text.

## 2 Comprehensiveness

A report must be comprehensive, providing all conclusions of importance (including negative results). However, trivial findings should be omitted, but judgement must be exercised to decide which results are significant.

## 3 Plagiarism

Take extreme care not to commit plagiarism under any circumstances. Always acknowledge work done by somebody else. During your study at the university, any report will be rejected if plagiarism was committed.

## 4 Scientific proof

Provide scientific arguments and *motivate* every statement that you make or provide a reference pertaining to the required motivation. Contents must be free of any unfounded assumptions and must be objective. Never base arguments on so-called "engineering judgment". Never give unfounded opinions. Be exact, correct, clear in all motivations. Be especially cautious not to give the perception of preconceived conclusions (that you want to 'prove' something).

## 5 Accuracy

Check the accuracy of technical information and data, not only for errors, but also that conclusions are given without bias or wrong emphasis.

## 6 Style

Write the report in the passive form – never refer to the first or second person (I or you). The past tense must be used to describe work that was done (e.g. "speed was measured"). Use present tense for the discussion of results and conclusions (e.g. "... it is therefore concluded...").

## 7 Readability

Write the report with the specific reader (audience) for whom it is intended in mind. The meaning of each sentence must immediately be apparent. Do not expect from a reader to read through the remainder of a paragraph to understand an earlier sentence.

## 8 Language

Use a formal academic, crisp and to the point style of language. Vary the length of sentences. Avoid unnecessary long sentences. Do not include superfluous information, but, on the other hand, do not omit any essential information. Always write complete sentences. Do not use abbreviations.

## 9 Paragraph structure

Start each paragraph with one sentence describing the theme of the paragraph (topic sentence). The remaining sentences of a paragraph must provide (technical) detail. Each sentence should ideally convey one aspect of this detail. Do not describe more than one important concept or give more than one fact per paragraph. Use bulleted or numbered lists to give more than one fact (see the bulleted list in 10 below).

## 10 Grammar

- Check language and terminology.
  - Check for the appropriateness of every word and sentence that you use.
  - Check each word to ensure that the correct English word is used.
  - Be specific with no possibility of misinterpretation.
  - Be consistent with the terminology you use.
  - Do not use colloquial (casual) language, slang or emotive words.
  - Avoid ambiguity such as "more rugged vehicles" (are these a larger number of the same strength or the same number but stronger?)
  - Do not endow objects with human attributes, e.g. "the equipment refused to operate".
  - Avoid vague expressions and clichés such as "it would seem" or "it is clear".
  - Avoid the common errors in English (see *Points to Remember and errors to avoid* Section A-2).
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## **Section B: Tips on reading and talks**

## P-R-R: How to Read Your Textbook More Efficiently

**PREVIEW – READ – RECALL** at first glance seems to be an intricate and time consuming process.

However, it gets easier and faster with practice, ensures thorough learning and facilitates later "re-learning" when you review for exams. Give it a try!

### **PREVIEW – Why?**

If you give your mind a general framework of main ideas and structure, you will be better able to comprehend and retain the details you will read later.

### **PREVIEW – How?**

1. Look quickly (10 minutes) over the following key parts of your textbook to see what it's all about and how it is organized:
  - Title
  - Front and back cover info
  - Author's biographical data
  - Publication date
  - Table of Contents
  - Introduction or Preface
  - Index
  - Glossary
2. Before you read each chapter, look over:
  - Title
  - Introduction
  - Sub-headings
  - First sentences of each paragraph (should give main idea).
  - Any diagrams, charts, etc.
  - Conclusion or summaries
3. Then answer the following questions:
  - What is this mainly about?
  - How is it organized?
  - How difficult is it?
  - About how long will it take to read?



### **READ ACTIVELY – Why?**

Being an active reader will involve you in understanding the material, combat boredom, and will increase retention.

### **READ ACTIVELY – How?**

Set realistic time goals and number of pages to be read.

1. Divide your chapter into smaller sections, rather than try to read the whole chapter non-stop.
2. Ask yourself a question before each paragraph or section, and then seek its answer. This will give you a definite purpose for your reading. Try inverting the sub-heading or first sentence into question form, using "who", "what", "when", "how" if necessary.
3. Take breaks when you feel unable to stay with the material due to day dreaming, drowsiness, boredom, hunger, etc. After a short break, you can return to your reading with more energy and alertness.

### **RECALL – Why?**

Research shows that 40-50% of the material we read is forgotten very shortly (about 15 minutes) after we read it. Immediate recall is an essential first step toward continued retention of the material.

### **RECALL – How?**

After reading each small section of material, choose one (or more) of the following methods:

1. Recall mentally or recite orally the highlights of what you have read.
2. Ask yourself questions (maybe the same ones you used before you read the section) and answer them in your own words.
3. Underlined and make marginal notes of the key words or phrases in the section. Underlining after you read is the best way to decide what's the most important information to remember.
4. Make separate notes or outlines of what you have read. This technique often works for more technical material, which you need to put into your own words.
5. Recall with a friend. What you don't recall, he/she might.

## TIPS ON TALKS<sup>§</sup>

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So you've got to give a formal talk in your class--a presentation on a term project or in a laboratory or design course or a class on public speaking. That can be a scary prospect if you're not used to doing things like that. Everybody's nightmare is looking foolish in public, and a public speech seems to most people like a perfect opportunity to do just that.

It really shouldn't be that frightening. Almost every day you have the experience of talking when others are listening to you and you don't even think about it--you just do it and it works out fine. There's something about giving a **SPEECH**, though, that gets people into a total panic. I'm not talking about feeling a bit nervous before the talk, you understand: stage fright is perfectly normal and a little of it may even make the talk better. (If you're too relaxed you could seem bored with your topic, and speakers who sound bored lead to audiences who *are* bored.) If your fear goes too far over the line, however, it can cut way down on your ability to communicate.

There are a few things you can do to make your talk effective--and if you know it's going to be a good talk, your pre-talk jitters are much more likely to stay under control. Good speakers all learn these tricks sooner or later. Sooner is better than later.

### Preparing

- *Speak to your intended audience at their level.* Avoid unnecessary jargon, and also avoid material you know will be obvious or trivial to them.
- *Include a clear introduction* (motivate and preview your talk), *body*, and *summary* (conclusions, recommendations).
- *Never present a large body of information without summarizing the main points on an overhead.* Be aware that your audience can only absorb a small fraction of what they hear and much more of what they can see.
- *Use overheads containing mostly short bulleted lists, diagrams, and charts.* A picture is worth a lot more than a thousand words. If possible, use presentation software (like PowerPoint) to generate the overheads.
- *Use large type.* Anything smaller than about 24-point will be hard to see in a large room.
- *Charts are better than tables. Lower case is better than all capitals.*
- *Skip (or at least minimize) the math.* Collections of equations are usually boring and/or incomprehensible in a lecture. If you're talking about a mathematical model, focus on what it does (predicts, correlates) and how well (or poorly) it works. If anyone wants details of the math, they can ask for them later. (They won't.)
- *If you show flow charts or plots, make sure they're completely labeled.* A chart with lots of unlabeled blocks and lines with arrows is pretty useless, as is a plot of  $W$  vs.  $x$  with no clue about what  $W$  and  $x$  are.
- *Plan a closing line.* Even if you give a great talk, ending it with "Um, I guess that's all I've got" or "I think that's the last slide" will do nothing for your cause. Say something like "That concludes my presentation--thank you for your attention" or "I'll be happy to take questions now--thanks for coming" or simply "Thank you."
- *Rehearse several times and make sure the timing is right.* Try to come in at least two minutes under your target time for the presentation. If you're running longer than that, find ways to cut it down.

## Presenting

- *Never read word-for-word from a script.* Very few people have the skill to read directly from a prepared text without putting their audience to sleep. Use the points on the overheads to guide you through the talk.
- *Make frequent eye contact with people in every part of the room.* Don't just look at your notes or the screen or the people directly in front of you.
- *Try to sound interested in your subject. If necessary, fake it.* An obvious lack of interest on the part of the speaker almost guarantees that the talk will not go well.
- *Keep track of the time.* If you see you're running short or long, try to adjust the speed of your presentation to compensate.
- *If you take questions, remember that "I'm sorry - I don't know" is a perfectly acceptable answer.* Trying to bluff your way through a tough question is usually a losing proposition.

And that's all there is to it. These practices may not make you the world's most spellbinding speaker, but they're bound to make your talk much better than it would have been without them. They also may not make speaking in public one of your favorite experiences, but they'll probably make you feel better about it than you do now and every little bit helps. Give them a try in your next presentation and see if they don't work for you.

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§ [http://www.ncsu.edu/effective\\_teaching/Papers/speakingtips.htm](http://www.ncsu.edu/effective_teaching/Papers/speakingtips.htm)

# Professor Felder is the Hoechst Celanese Professor Emeritus of Chemical Engineering at North Carolina State University. He has contributed over 200 publications to the fields of science and engineering education and chemical process engineering.

He offers more useful hints for students on his web page:

[http://www.ncsu.edu/effective\\_teaching/Student\\_handouts.html](http://www.ncsu.edu/effective_teaching/Student_handouts.html)