MSc in Product Design Engineering – Technical Report Guidance – Session 2018-19

- Technical reports should be printed/bound and submitted to the Teaching Office, Room 620, in the James Watt Building South before **10:00 am** on **Monday, 12th August 2019**.
- There should also be a second technical report printed and bound to be submitted as a reference with the project submission at GSA, to avoid having to duplicate technical information in the project report.
- Students should also e-mail a Reduced Size PDF file (i.e. Screen resolution, not 300 dpi) of their technical reports to their respective supervisors in case there is difficulty in distributing the reports. Please copy to leza.higgins@glasgow.ac.uk
- These reports are graded/marked by your technical supervisor at GU, using the standard report marking sheet (see copy below) for Master's level projects. This technical report grade (25%) is then merged with your design project grade (75%) assessed by staff at GSA to obtain a final overall MSc PDE Major Project grade.

PREPARING TECHNICAL REPORTS

INTRODUCTION

Preparing technical reports is an important part of an engineer's working life, whether they are to inform senior management, to present research findings to the scientific community or to present contracted work to clients. These guidelines will help you write a technical report in a way that will present your work in the best light and help you score good marks in assignments and projects.

Firstly, read every word of any instructions you receive and do *at least* what's asked. The instructions given are often the minimum requirement and you might consider that additional information is required.

Start to plan the report at the start of a project. Write down some headings, or some introductory paragraphs, or brief phrases to be expanded later. What you write will evolve as the work continues but *it's better to have a plan that changes rather than no plan at all*.

The format of a report will often be specified by whoever commissioned it. As a default, use 11-point Ariel font, with a line spacing of 1.5, on unlined A4 paper, with larger drawings folded and bound-in or inserted in A4 plastic wallets bound with the report. The pages must be securely bound: *a single staple isn't secure*. Text should be word-processed but equations, diagrams and notes on figures can be handwritten. No penalty will be incurred for such handwritten items *provided they're neat and legible*.

The level of technical knowledge required of the reader will vary from the educated layman, for a popular technical article, to the engineering scientist, for a research paper. As a default, the readership should be assumed to be professional engineers without specialist knowledge of the area.

A technical report should contain a full record of your work but it's not a novel: *data reduction and concise writing are essential engineering skills*. Nor is it a PhD thesis, and individual project reports should be up to:

- 30 pages for a PDE technical report

including graphs, diagrams, appendices, references, etc. The report must be no longer than is necessary to fully report the work and, indeed, *may be shorter than the guideline if appropriate*. Only in exceptional circumstances should you submit a longer report and you must first discuss this with your supervisor.

I have made this letter longer than usual, only because I have not had the time to make it shorter (Pascal).

The main body of the report should contain only matter central to the investigation. Peripheral and supporting material such as computer listings should be given in appendices or as references. Don't include material like complete Abaqus input files containing lists of hundreds of nodes and elements. Cut and paste only the relevant parts of such files.

The technical content of the report is paramount but good presentation and concise, well-written text will attract higher marks than verbose, untidy offerings with similar technical content. *Drawings and graphs are to be of professional engineering quality*, either hand-drawn or computer-generated. Don't spend an hour drawing a graph on Excel that you could have hand-drawn in 15 min but be aware that, unless you're a talented draughtsman, it's difficult to draw good quality graphs freehand. So ***splash out on some drawing instruments*** such as a straight edge, protractor, set squares, compasses *and a flexible curve*.

The report should be written in formal English rather than the informal English used in my lecture notes. For example, use *it is* and not *it's*. Current practice in technical writing is to use the third person thus *several experiments were performed*, rather than the first person *we performed several experiments*. You should adopt this practice.

A report should be well structured and informative to a reader who isn't familiar with the problem. It is a good idea to have a friend or relative proof read the final draft of the report to ensure that *you have actually written what you think you have written* and that it makes sense.

Submit the report on time.

REPORT STRUCTURE

Think about the structure of your report early on and discuss it with your supervisor. The following format is a good basis for most projects:

Summary

The *Summary* (or *Abstract* or *Executive summary*) is the first section in a report but must be written last, since only then will you know the work to be summarised. It's a 1-page summary of the content of the report and should outline what you've done and your main findings. However, it's not an introduction and *all* of its contents should be covered in greater detail later in the report.

List of *objectives*

State the original objectives for your project as agreed with your supervisor and describe to what extent they have been achieved. If any objectives haven't been achieved, explain why not.

Preliminaries

All sections and pages of the report are to be numbered. Before getting into the report itself, you are to include:

- a *Contents* page
- a list of *Figures*
- a list of *Notation* and, perhaps, a *Glossary* of uncommon *Nomenclature*.

Introduction

The *Introduction* should explain:

- the background to the problem, e.g. *vibration is a severe problem in…*

- why the results are required, e.g *the results will allow improved design of…*
- the specific problem to be addressed, e.g *the aim of the work is to find the response…* (the aim is ***never*** *to find out how to run Abaqus…*)
- the general methods you will use, e.g *a finite element approach is adopted using the Abaqus package from HKS Inc…*

The introduction should also contain a concise summary of previous relevant work in the field, unless a separate ***Literature*** section is included.

The work in detail

The introduction should be followed by a description of the work you actually performed. The headings used will depend on the work in hand and there may be separate sections for each different aspect of the work, e.g separating analytic theory from finite element modelling, or separating different finite element runs.

Avoid writing 'methodology' when you simply mean 'method'!

Results

This should contain the results of the detailed work, giving numerical values if appropriate, perhaps in tabular form. In some cases it may be more appropriate to have a small results section after each section of the detailed work.

Graphs and figures can be embedded in the text or collected at the end of sections or the whole report. However they're arranged, they must be numbered *and referred to in the text by that number and by their content*, even if the content is on the diagram. For example, *Figure 2.5 shows the natural frequencies of… .*

Graphs must have axes complete with appropriate units but there is some disagreement about how to present multiples of ten. For example does $Pa\left(x10^{(6)}\right)$ on an axis mean that the numbers have to be multiplied by $10^{(6)}$, i.e the scale shows MPa, or that they've *already* been multiplied by $10^{(6)}$, i.e the scale shows μPa? Figure 1 shows two ways of representing stress in a manner that is unambiguous. Notice also that experimental curves, such as that in Figure 1, need not go through all or, indeed, *any* of the data points. Only points such as $(0,0)$ are special. Be careful of this when using Excel: it will default to a piecewise linear curve that goes through all of the data points.

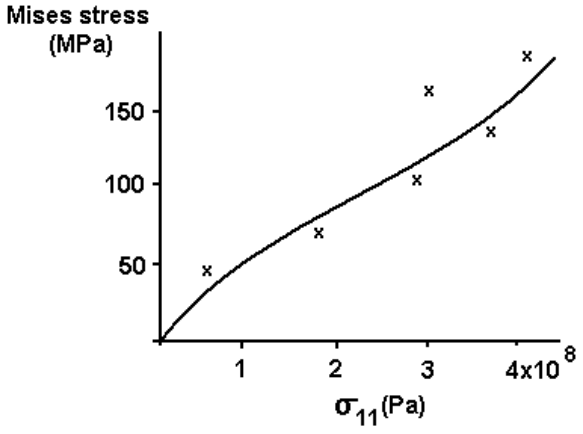

Figure 2. How to show axes.

Discussion

This means discussion of the results: are the values high or low? Are they expected or unexpected? How does 'theory' compare with computational analysis? How do different computer runs compare? What are possible reasons for discrepancies and which sources are likely to be most significant?

Conclusions

The ***Conclusions*** section might be added into the discussion to give *Discussion and conclusions* but in either case, conclusions are needed. These should relate back to the objectives and the task set in the introduction.

References

A report that was completely self-contained would be enormous and an alphabetic list of ***References*** should be given at the end of the report to point readers to original sources and to additional information not included in the report. For example, the detailed instructions on how to drive Abaqus are not important to most readers and so the main text might include the phrase *the finite element program used was Abaqus (HKS(1997))* and a reference such as:

HKS Inc (1997). Abaqus Version 5.6 User's Manual, Providence RI, USA.

included in the list at the end. Similarly, the derivation of analytical formulae or material properties might be omitted from the report and the phrase *the elastic modulus of steel is given by Ashby and Jones (1986) as…* used in the main text, with the reference:

Ashby and Jones (1986). Engineering Materials Vol 1, Pergamon, Oxford.

listed at the end. A paper in a scientific journal might be referenced at the end as:

Gibson RJ and Thomson RD (1995). The generation and effect of thermal transients in ceramic composites. Journal of Composite Structures, Vol 32, No 1-4, pp 435-444.

and within the main report you might say *Gibson and Thomson (1995) are seriously wrong in their analysis*.

It is acceptable to include some web references but part of the aim of the project is to teach you how to research a subject and so *a reference list in which every item starts http will degrade your mark*.

Bibliography

In contrast to a list of references, ***Bibliography*** or *Further reading* is an optional but useful section that lists additional sources that will allow the reader to extend their knowledge beyond what is contained in the report.

PLAGIARISM

Obviously, you are free to consult friends, colleagues, staff, external references, etc when writing your report but

it must be written in your own words

and you must include the *Declaration of Originality* at the start of the report. Of course, it's inevitable that the same short phrase will appear time and again in different documents but anything more than that is plagiarism. You can quote extended passages from someone else's work but you must acknowledge the author and give a reference, even if it is a classmate. *This applies equally to diagrams and*

graphs - ***if no acknowledgement is given, you are claiming the work as your own***. If it isn't, you may find yourself in trouble with both the University and with the real author of the work. The University will take disciplinary action against anyone guilty of this, as noted in:

http://senate.gla.ac.uk/discipline/plagiarism/

The real author may take you to court.

Even when staff have hundreds of scripts to read and assess, it's remarkably easy to spot plagiarised material. Don't even think about it!

BIBLIOGRAPHY

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A dictionary of modern English usage. H W Fowler. Oxford Press, 2003. ISBN 0-19-860506-4.
Eats, shoots and leaves. L Truss, Profile Books, 2005. ISBN 861976771.
The complete plain words. E Gowers, 1986. ISBN 0-11-701121-5.

Online English Grammar
http://www.ucl.ac.uk/internet-grammar
http://webster.commnet.edu/grammar/index2.htm
http://www.usingenglish.com
http://www.englishpage.com
http://englishplus.com/grammar/gsdeluxe.htm
http://www.wsu.edu/~brians (click on 'Common errors in English')

A Web of On-line Dictionaries - links to many dictionaries in many languages
Webster Dictionary Search Page

Roget's Thesaurus
Webster Thesaurus Search Page

Dr. Jay's "Write" Home Page
Writing Related Internet Sites
http://grcpublishing.grc.nasa.gov/editing/chp2.CFM
NASA guidelines on technical report writing