Guidelines for the preparation of Computational Physics Report Coursework 1

your CANDIDATE NUMBER goes here

# Department of Physics, University of Bath, Bath BA2 7AY, United Kingdom Date submitted: 7 Feb 2022

# Abstract

This document outlines the format that should be used for the coursework 1 report for Computational Physics B (2022 edition). A version of this document is available on Moodle, and may be used as a template. This document was adapted by Dr David Tsang and Dr Anton Souslov from an original by Dr Robert Jack, Dr Simon Crampin, and Dr Ville Rimpilainen.

**Introduction**

The ability to communicate results and ideas is an important scientific skill. The most important thing for your reports is that the arguments and explanations should be clear and logical. You should present your results in a way that makes them easy to interpret. This will help you to draw conclusions that are accurate and precise.

Results from scientific research are usually communicated as reports and articles published in scientific journals. These journals often impose particular styles and formats on the articles that they publish. Authors are required to produce documents, that that are consistent with the journal’s “house-style”, and which are constrained in terms of length. To give you experience in this skill, this document outlines the style that you should adopt in the preparation of your Computational Physics report.

**Basic elements**

Scientific journals often impose a length restriction on reports and articles. **Your reports should be no more than 5 pages long**. This limit does *not* include appendices, but if your appendices are very long, this is usually rather confusing for the reader. This is not good style.

Use a font size of 10pt. Your report should be prepared using two-column format, with columns 8.5 cm wide and 0.5 cm apart. Left and right margins should be set at 1.75 cm. The start of the report should contain in one-column format an appropriate title, your candidate number and affiliation, the date, and an abstract. Remember, an abstract is a section of text that should be capable of being abstracted from the document along with the title and placed in a searchable database. It should therefore be self-contained, and should summarise the main aspects of the work to be found within the report – the main aims, and key results. See Ref. [1] for examples of abstracts of scientific articles, or look in journals on the web or in the library.

Paragraph text should be justified. The main body of the report should be divided into sections, each starting with a heading. Sections may be numbered. Typically reports should begin with an overall introduction, end with an overall summary, followed by an acknowledgements section and references. However, be prepared to be flexible if your material demands it – for example, if your report contains studies of several different phenomena, you could use separate introduction and summary sections for each one. (You do not have to stick to a standard *Introduction – Methods – Results – Conclusions* structure.)

It is probably a good idea to include some code snippets that explain how you modified the example programs in order to achieve what you want. These code snippets should go in an appendix, probably best in single-column format. It is a good idea to provide a couple of sentences explaining where each code snippet comes from and what it does. There should also be comments in the code to explain it actually works.

**Equations**

Any important equations in your report should appear on separate lines and be numbered. They should be created using the equation editor. Remember to define the quantities in the equation, and punctuate appropriately. An example is

, (1)

which is the equation of a straight line, where is the gradient and the intercept on the axis. Note the comma, to punctuate the equation within the text. Note also that variables should have the same appearance (font) in equations and in the main text.

**Figures and Tables**

Any figures and tables should be prepared for either one-column or two-column width, which you find more appropriate. Figures should be numbered as Figure 1, 2, 3 etc, and tables as table I, II, III etc. Each should have its own caption, containing a brief description of the content. You should place each figure/table and the accompanying caption in a textbox, convert to a frame, and position appropriately. Do not use a border, and position the figure or table as close as possible to the first reference in the document. Figure 1 shows an example.

Figures should always be mentioned in the text by referring to their figure number – don’t expect the reader to know automatically which figure you are talking about. It is usually good style to place figures and tables at the top of the page (but not on page 1). If the top of the page is not suitable, the bottom of the page can also be good. It is not usually a good idea to have figures floating at random in the middle of a column. Positioning the figures is best done when the text of the document is finished.

You should think about the best design for your figures. Don’t try to include every result you generated – be selective. Remember the main idea is to understand the behaviour of the models, and how these are related to the underlying physics. If you can think of a creative new way to do this, that’s great, as long as it’s clear what is going on.

It’s not a good idea to use two figures where one figure containing two curves will do – especially if you intend the reader to compare the two curves. You must also make sure that your figures are legible – the font used in any labelling should be sufficiently large, the line types distinguishable, or if colour are used they should contrast well – avoid yellow lines, for example, as they often disappear against a white background.

Figure 1. Method of graphical solution of the mean-field equation for the magnetisation in the Ising model (see Ising model handout). Note the fonts in the figure should probably at least this large, to ensure readability.

**Miscellaneous**

Make sure that the pages of your report are numbered 1,2,3 etc. Also make sure that you cite source material appropriately and acknowledge any contribution made by others. To not do so is plagiarism and/or scientific fraud – credit should be given where credit is due. If in doubt, you may ask me for advice.

To help with handing back of project reports, please complete a green cover sheet (available in the lab) – these ensure that we can mark the reports anonymously but still return them to the right people.

**References:**

[1] T. A. Witten and L. M. Sander, Diffusion-Limited Aggregation, a Kinetic Critical Phenomenon, *Phys. Rev. Lett.* 47 (1981) 1400-1403

## Appendix / Appendices

Appendices can be in single column format, which makes it much easier to include code snippets, etc. But make sure that everything is clearly readable, and that the main text of the report explains what is in the appendices, and why you have included them.