

## **Eng. Physics 3D03 Lab. Report Requirements**

There are two purposes to undergraduate labs:

- (1) to learn the material presented in each experiment, and
- (2) to learn how to properly write an experimental lab report.

This section addresses the second issue. Since your lab reports will constitute your entire mark for this course, make sure you understand the following information — and see your instructor if you have any questions.

### **1. FORMAT**

Fourth year undergraduate lab reports should follow scientific report format. For this reason, it is strongly recommended that each student look at any scientific journal in the library and get an idea of how authors present their ideas and findings. A good rule of thumb is to pretend that a student like yourself is going to use your report — and only your report — to repeat your experiment, which includes referring to your analysis for answers about anomalies, etc. Could you have used your product as a lab manual? The lab format should include the following areas.

#### **1.1 Abstract**

In 150 words or less (no diagrams or tables), make a statement about the purpose, method, and summarized results of your report. The intent of the Abstract is to provide an encapsulation which can be quickly scanned by someone doing a literature search. The Abstract should be the last thing you write for the report, not the first.

#### **1.2 Introduction**

Set the stage for the rest of the report. All relevant theory should be briefly outlined, leaving lengthy derivations for an Appendix or for further reading (if not directly relevant, or considered to be commonplace). Fully, but succinctly, describe the motivation or purpose of the experiment, and include an overview of any "new" (new to you) experimental and analytical methods that will be employed. Leave mundane details to the experimental section. You can refer to previous work, citing a reference. The introduction should be the second biggest section of the report, next to the analysis.

#### **1.3 Experimental Details**

Provide a brief description of (1) the equipment used (include model numbers), and (2) the procedure followed. Use a simple and logical approach, but do not get bogged down with fine details. A diagram of the apparatus or a flow chart of the process, fully labelled, is expected.

#### **1.4 Results**

This is the place to present your findings — not the raw data — for subsequent discussion. Summarize all data in tabular or graphical form, and provide enough text with each Table or Figure to fully explain what you are showing the reader. An error analysis should always be included.

## 1.5 Interpretational Discussion

This is the "meat" of the report, and should provide the major portion of the text. Completely, but with brevity and clarity, analyze your results. Stay consistent with the purpose of your report, as outlined in your Introduction. Attempt to explain all anomalies encountered. Provide an error analysis, where possible.

## 1.6 Conclusions

Summarize your findings very briefly, putting the entire report into perspective. Were your goals achieved?

## 1.7 Extensions or Improvement of the Work

This is your chance to give your own thoughts on the experiment. What can be done to improve the results? This section can be included with the Conclusions if appropriate.

## 1.8 References

Include all sources, **with numbers corresponding to their use in your text**. As a rule the lab manual is not a valid reference. It is important to use external sources of information in your analysis. This includes related work on the same subject, as well as simple references for the technical facts discussed throughout your report. The library is an extremely accessible resource for any topic that is covered in 4U4 Nuclear, as are the many professors and graduate students that do work in these areas. In general, any lab report is useless to the scientific community if it does not fully document its sources of information and its place in the body of literature that already exists. Please note that a list of related literature at the end of a report does not, by itself, fulfil this role — each item in the list must be referred to somewhere in the body of the report, and so marked.

## 1.9 Appendices

Lengthy derivations, lists of data taken from references, and any other item not suitable for the body of the report belong in an Appendix, properly labelled and titled (e.g. "Appendix 1: Derivation of ..."). Each appendix should be referred to at least once in your report, but keep in mind that Appendices are (by definition!) supplementary, and the reader should not have to look at them to understand your report. Unless otherwise specified, raw data need not be included with your report — but if you wish to attach it, put it in an Appendix.

## 2. CONTENT

Undergraduate lab reports sometimes lack originality and a sense of personal initiative. It is important to remember that you are not just answering required questions, as with an assignment, but documenting a scientific quest and thought process. Suspend your disbelief in the overall importance of the subject, and imagine you are reporting a completely new experiment to the world. The following points should be kept in mind:

## 2.1 Figures and Tables

A good report puts as much priority on visual impact as on substance simply because information can be presented most efficiently through well-planned figures and tables. Make these neat and uncluttered. Label all figures and tables with a number and a title — above for tables and below for figures. Every non-textual and non-equation item in your report is either a figure or a table — graphs should be labelled as a figure. Make a list of figures and tables. Figures should not just appear in the report without comment. It is important to draw out the relevance of the figures in the text of your report.

## 2.2 Questions

The 4U4 Nuclear lab manual often includes a series of questions to be answered in a lab report. This does **not** imply that these should be the only points covered in your analysis. It is also not expected that the student will simply provide answers, one after the other, for each question (this is a grade-school approach that should have been dropped long before fourth year university anyway). The questions are merely there to point you in the right direction, and their answers can usually be included in the text of your Interpretational Discussion. Some questions can (and should) be addressed in the Introduction part of the report, due to their expository nature.

## 2.3 Writing Style

A good lab report uses simple language, explains all uncommon terminology, is clear, succinct, and — perhaps most importantly — displays a unity of thought. "Padding" (digressing in order to fill space) is obvious in a format like this. Length has relatively little importance, provided the content is complete (*a ballpark report length for a normal lab is about 2000 words*). Also, many students wrongly think spelling and grammar are low-priority issues in an engineering or scientific report.

## 2.4 Comprehension

Above all, the report should link with the first "purpose of undergraduate labs" mentioned at the outset — teaching of the presented material. Your introduction, presentation of results, and discussion should display a reasonable comprehension of the subject. In fact, a written lab report is the best way, short of an oral interview, of determining this. By definition the subject of each lab should be new to most students, so use your time in the lab (and your proximity to the instructor) wisely — ask questions, learn as you go, come back to the instructor later with your concerns. Unlike, perhaps, assignments in a lecture course, each submission in a lab course like 4U4 Nuclear will make abundantly clear your level of understanding and motivation.

### 3. MARKING SCHEME

The following marking scheme will be used to grade each report. Sufficient comment should be provided by your instructor to explain his/her grading decisions.

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#### 3D03 MARKING SCHEME

##### Content (70%):

Abstract	5
Introduction	10
Experiment & Results	5
Interpretational Discussion	40
Conclusion & Extensions	5
References	5
<hr/> SUBTOTAL	<hr/> 70

##### Presentation (30%):

English (spelling, grammar)	5
Technical Writing (clarity, unity)	10
Visual Quality (figures and tables, neatness)	10
Originality	5
<hr/> SUBTOTAL	<hr/> 30
<hr/> TOTAL	<hr/> 100

**Teaching Assistant Marking Guide Sheet**

**Sample**

Name: \_\_\_\_\_

Lab #: \_\_\_\_\_

**Content (70%)**

Abstract	_____ (out of 5)
Introduction	_____ (out of 10)
Experiment & Results	_____ (out of 5)
Interpretational Discussion	_____ (out of 40)
Conclusion & Extensions	_____ (out of 5)
References	_____ (out of 5)
<b>SUBTOTAL</b>	_____ (out of 70)

**Presentation (30%):**

English (spelling, grammar)	_____ (out of 5)
Technical Writing (clarity, unity)	_____ (out of 10)
Visual Quality (figures, tables, neatness)	_____ (out of 10)
Originality	_____ (out of 5)
<b>SUBTOTAL</b>	_____ (out of 30)

**TOTAL** \_\_\_\_\_

Deduction for lateness: \_\_\_\_\_  
(5 percentage points/day)

Comments: \_\_\_\_\_

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T.A. signature \_\_\_\_\_ Date: \_\_\_\_\_