SS NPCAM PROJECT 2019-2020

Contents

SS NPCAM PROJECT GUIDELINES

Please read the following instructions carefully. The SS project accounts for roughly a third of your final-year marks, so you need to commit to the project and work very hard over the **9** week period.

Schedule

Projects run from the start of Michaelmas term, Monday, **9th September,** to 11th week of term, **Friday 8th November 2019**. (Projects continue through Study Week, i.e. Week 7). Lecture commence at the start of week 10, **Monday 11th November 2019**.

Interim Report

A 1-page outline (covering scientific goals, the methods that you intend to use) must be submitted via *Blackboard*[1] as plain text, not later than *5 p.m. on* ***Friday 13th*** **September 2019.** Please discuss this summary with your supervisor.

A brief interim report, of maximum length 500 words, must be submitted via *Blackboard*, not later than *5 p.m. on* ***Friday 11th*** **October 2019** (the end of the 7th week of Michaelmas Term). Diagrams, tables etc. are NOT required.

Draft for Supervisor

A draft copy of your report should be submitted to your supervisor for feedback in plenty of time before the deadline for submission of the final report.

Final Report

1. Five Hard copies of your final report are required. Three copies must be handed in to the School of Physics Office, ***not later than the first teaching day of Semester 2*****, Monday, 20th January 2020.** *Further, softcopy of the report will also have to be submitted by Monday, 20th January 2020, via Blackboard. THIS IS A HARD AND FAST DEADLINE.*
2. The fourth copy should be handed in person to your project supervisor. If your project is outside College, you should ensure that your supervisor receives a copy by the same date. When you submit your copies, you will be asked to confirm that you have already given a copy to your supervisor.
3. Report submission is always your personal responsibility. If you fail to submit a report you can obtain no marks for it.
4. If an *ad misericordiam* reason, such as illness, appears likely to prevent you from handing in your project report on time you must contact the Head of School as soon as the problem arises. An *ad misericordiam* reason will not be considered if it is offered after the submission deadline.
5. You must also retain a fifth copy of your report for yourself, since none of the submitted copies will be returned to you. You should bring your copy with you if the External Examiner calls you to a *viva voce* examination after the Moderatorship examinations.

Poster

You are required to present a poster of your work, which will be assessed at the poster exhibition, typically held on an afternoon in the middle of February: details will be circulated

[1] Please enter Course PYU44NP2 and click "Reports". Please check the Similarity report generated by the system and revise your reports if necessary.

later. A poster template can be downloaded from *Blackboard.* You must submit the softcopy of your poster via *Blackboard* and email the Powerpoint slide of your poster to the Colm Stephens, at stephec@tcd.ie, by Monday, **20th January 2020.** *Remember to use your name in the filename of the email attachment to allow identification.* The School will arrange for the A0 poster to be printed off and you will be notified when you can collect it, typically shortly before the poster session.

GUIDELINES FOR WRITING FINAL PROJECT REPORTS

Your project final report should contain the following sections:

- Title page
- Abstract
- Acknowledgements
- Plagiarism
- Contents
- Main body of report (25-30 pages)
  - Introduction
  - Theory/Background
  - Experimental Method
  - Results and discussion
  - Conclusions
- Bibliography/References
- Appendices

At the beginning there should be a **Title page** (no specific format– but it should at least contain the title, you name, student ID, your course and the date of submission), with next a page containing a short **Scientific Abstract** (around 100 words) summarising the whole work. After this you must acknowledge the support you received from the project supervisor, postgraduate students, etc in a paragraph entitled '**Acknowledgements**': examples of what is required may be found below.

"Acknowledgements" are necessary to clarify your role in the project and the help you received. An example is given below.

I was shown how to prepare samples by research student AB. It was necessary to adapt the sample holder, which I did with the advice of workshop technician CD. I made a range of samples and characterized them myself using a number of different experimental techniques, to which I was introduced by postdoc EF. I was shown how to use the analysis software by research student GH. It was necessary to modify the software for my samples, which I did with the advice of postdoc IJ. I analysed the results and interpreted them myself. My supervisor commented on an outline of the project report. I am grateful for the advice and encouragement given by all members of the research group.

Then there is a **Contents** page - so make sure that the report is paginated. The pages for the sections from Title page to Contents are numbered i, ii, iii, iv, v etc; from Introduction onwards page 1, 2, 3... is used.

In the **Introduction** you should describe concisely the area of physics, chemistry, materials or nanoscience in which you are working, perhaps beginning at a non-specialist level and ending at a senior undergraduate level. You should clearly outline the problem that you have been set, and introduce the experimental methods (where appropriate) and methods of

analysis that you are going to use in later sections. You may wish to include a description of physical theories relevant to your work and these could be included in the **Introduction** or in a separate **Theory** or **Background** section, as appropriate.

The section entitled '**Experimental Method**' (or '**Computational Method**') should give an adequate, but not overly detailed, description of the experimental methods you actually used and/or the method of analysis. Include figures as appropriate. Diagrams, figures or graphs should be inserted in the text close to where they are described. As a general rule it is very important that for every instrument or method that you rely on for a measurement, you must understand and be able to describe its operation and the scientific basis for its operation in great detail even if it is not necessary to repeat all except the most relevant details in the report. It is not sufficient that you know how to operate the machine/instrument/tool without a detailed understanding of how the measurement occurs or what the tool does, and this should be borne in mind. Where it is vitally necessary in the context of what is described in the report for a particular instrument or method to be described in detail, then do not hesitate to do so. The section on experimental method should also include an introduction to any method of analysis of the results that would not be immediately familiar.

In the section entitled '**Results and Discussion**', the results should be presented in a suitable form, e.g. tables and graphs. If there are many results then the less important ones may be relegated to an Appendix or even omitted. Do not include tables or graphs without reference to them in the text. **Remember to include error analyses of your results and discuss possible sources of systematic error.** All figures (including graphs) and tables must be numbered and captioned, and referred to in the text. By convention, figure captions go below the figure, table captions go above the table.

In particular when discussing the results, suitable reference should be made to the theory, background or methods in use during the project and introduced earlier in the report. Wherever possible, a detailed analysis of the raw results should proceed by the standard methods available for the subject area or by the methods previously introduced. The details of any such analyses must be sufficient for any reader to be able to arrive at the same conclusion as is drawn in the project report. Discuss what the results of specific measurements or specific observations mean in the context of the scientific goals outlined for the project. Be sure to indicate the most significant results and discuss the implications of these results. Discuss whether the results obtained are in agreement or disagreement with expectations from theory and explain any deviations. Any unexpected results should be explained or a reasonable hypothesis put forward to explain them.

*Your data analysis, results and discussions **must** include appropriate estimates, calculations, and discussions of all sources of both random and systematic experimental errors and their influence on your conclusions. Results should only be given to the appropriate significant figures based upon the estimated experimental certainty. Detailed examples of the error analysis should be included in an appendix. Failure to include consideration of errors or measurement uncertainties in your report is a grave omission.*

In the '**Conclusions**' you must address whether the initial hypothesis for the research was valid or not. In discussing the results, you should address whether you achieved the goals set for the project, the significance of particular results, how you might have improved the experiment, suggestions for further work, etc. Use your common sense and imagination when writing this part.

Any formal article has a section at the end for a **bibliography** (list of related works, usually books) and references to books and journal articles actually cited in the text. *Citations are* **always inserted** *where a result from the existing* **literature** *or* **another author** *is used in the context of your report, whether this result is an equation, an observation or a set of measurements that is discussed, commented on or compared or contrasted with your own measurements.* In addition a citation must be given where a figure or diagram from another source is included in your report. No citations are necessary if the diagram or graph is original to your report. Use a standard format when citing books and articles. Recommended formats are, for a book,

> H.D. Young and R.A. Freedman, University Physics (9th edn, 1996) pp 1193-94, Addison-Wesley

and for an article,

> J. Bloggs, *Phys. Rev. Lett.* **76** (1998) 1234 (volume, year, page number).

References in the text to a book or article are cited using either

- a consecutive numbering system (e.g [1], [2], ...) with the references in the bibliography arranged in numerical order
  or
- the surname of the first author of the article enclosed in parentheses (eg [Bloggs]). In this case the references in the bibliography are arranged in alphabetical order.

The main body of the final report ("Introduction" to "Conclusions") **must not exceed 30 pages**. The title page, abstract, acknowledgements, contents and appendices are *in addition* to this limit of 30 pages. Additional non-essential information should appear in the Appendix and the whole report should not exceed 50 pages. Note that a report whose **main body** of content is substantially smaller than 30 pages would be considered grossly deficient. In all probability such a report would inadequately reflect the research project and would have substantial deficiencies of information or detail in several of the expected sections of the report which are listed at the start of these guidelines. *Do not submit a report whose main body is less than 20 pages as that would clearly be inadequate!*

The report should be produced using a word processor (remember to make adequate backups!). **A 12 point font size must be used, with 2.5 cm margins. The text must have a line spacing of 1.5.** The report should have a soft back or spiral binding.

Students doing their projects **in an industrial laboratory** may be asked by their supervisor to prepare an internal report for the company. While there will be a lot of material common to both reports, you should keep in mind that the report you present to College will be assessed on its "academic merit" and scientific content. Highly confidential material related to the company should not appear in the "College" report. Your supervisor will be asked to read your "College" report before you leave and therefore you should have your report written before leaving the placement.

SS NPCAM PROJECT MARKING

There are four elements contributing to the final mark for the Research Project

- The Supervisor's mark 40%
- The 2nd and 3rd Reader's mark (20% each) 40%
- Poster mark: 2nd, 3rd Readers (10% each) 20%

Supervisor's Mark

Guidelines for the breakdown of the Supervisor's mark:

• Results obtained	25
• Effort and Performance	45
• Initiative and Understanding	30
Total	100

A brief justification for the marks awarded in each category should be provided.

Second and Third Readers' Marks

Guidelines for the breakdown of the 2nd and 3rd Readers' marks for the report:

• Introduction/Background	20
• Scientific content	50
• Presentation	20
• Conclusions	10
Total	100

A brief justification for the marks awarded in each category should be provided.

Poster Mark

A poster presentation by the student will be made to academic staff in TCD in February/March **2019**. Guidelines for the breakdown of the Poster mark:

• Understanding	50
• Presentation	50
Total	100

This poster mark will be provided by the 2nd and 3rd Readers after they interview students during the poster session. Where a Reader is unavailable to attend the Poster Session, they must make arrangements for another staff member to attend on their behalf and inform the Course Director of the arrangement.

The marks for each student from each component will be considered by the Course Director and where there is a substantial discrepancy between 2nd and 3rd readers and/or supervisor, a panel of examiners including the Course Director will then moderate the final marks for that student.

INFORMATION FOR EXTERNAL SUPERVISORS

Firstly, we in Trinity College Dublin are very grateful that you are hosting a final year undergraduate student in your research group. You are thus contributing to our undergraduate Nanoscience Physics and Chemistry of Advanced Materials (NPCAM) degree programme. Thank you!

Value of Project to Student

This undergraduate research project is a significant part of the student's final year of their undergraduate studies. The project represents 20/60 credits of the final year, which itself contribute 65% of his or her degree mark. Thus the undergraduate research project contributes 19.5% to the student's final degree mark.

Value of Student to you

We hope that the NPCAM student you are hosting will be able to make a substantive contribution to your own research goals during the course of his/her placement in your group. For academic year **2019**, the duration of his/her project should be a minimum of **nine** weeks where they should be **considered a full time research student** embedded in your research group, albeit one who has not yet completed their undergraduate degree. Thus they are likely to need the appropriate guidance or instruction that should be expected at this stage of their education.

Research Project: Scientific objectives

The student while placed in your research group is required to carry out a research project, relevant to the NPCAM degree course they are studying. Preferably this is a project with a **specific scientific objective** that he/she (or you) can anticipate he/she being able to complete within the time available. They are required to write a report on this research project which will be judged by the academic evaluators here in TCD on its **scientific content** as the student is obtaining a <u>science</u> degree and is not obtaining an engineering one.

Please bear this caveat above in mind if the student is contributing to either instrument development such as the further development of a measurement technique or to much larger engineering collaborative efforts and/or engineering decisions. Within the context of either of these situations please try to define a specific scientific objective or scientific aspect that the student can obtain some substantive original results as a result of their work that can be presented and discussed within their reports.

Outline of Project

I have asked the student that after one week of the project that they submit a **1-page outline of the scientific goals** of their individual project, the methods that they intend to use in achieving these goals, and any expectations that there might be about the results. They are asked to discuss this summary with you, their supervisor.

Progress report: The student is asked that after **five** weeks has ended that they submit a 1-page outline of progress or otherwise in striving towards the intended project goals. It should outline any deviations from the intended course of the research project.

Project report: The student must ultimately write a project report encompassing the scientific objective, background, a survey of the most relevant literature, an outline of the techniques and methods to be used, an analysis and interpretation of the results, and drawing

appropriate inferences or conclusions. The main part of the project report is of 30 pages in length with additional pages for appendices as necessary. This report is submitted for evaluation here in January and you are to receive a copy. The student is expected to obtain guidance from you as to the analysis of data and the content of their report and a draft version of the report should be essentially complete before the 9 week period is over. The guidelines and instructions that the students receive on the structure of the report are attached.

Evaluation: The NPCAM student's performance in carrying out the research project is evaluated by you as their supervisor, and the project report is then evaluated by two examiners here, accompanied by a poster presentation of the project and its results. A final mark is obtained from all of these contributions. The marking scheme for the project as a whole is attached. The evaluation guidelines for you as the external supervisor are also attached.

Problems: Please contact the course director immediately at npcam@tcd.ie if any problems arise.

APPENDIX A: SUPERVISOR ASSESSMENT FORM

University of Dublin, Trinity College
NANOSCIENCE, PHYSICS AND CHEMISTRY OF ADVANCED MATERIALS
SENIOR SOPHISTER PROJECT
SUPERVISORS REPORT 2018-2019

Name of Student:	
Title of Project:	
Period of project:	From .....___..September..... to …___..December.....
Duration of project:	…..... weeks
Name of Supervisor:	
Position of Supervisor:	
Name of Institute:	
Date of supervisors report:	

Guidelines for the breakdown of the supervisor's mark:

The supervisors mark should be given out of a total of 100. These marks should be broken down into the four categories below with at least a paragraph of comments to justify each mark. Additional guidelines on the overall mark for supervisors external to Trinity College Dublin are on the next page.

Summary of marks:

Categories	**Total**	**Mark**
Results obtained	**25**	
Effort and Performance	**45**	
Initiative and Understanding	**30**	
Total Supervisors mark for project:	**100**	

Signature:	

Would you take a student from the Nanoscience Physics and Chemistry of Advanced Materials programme in the future ? _____

Please return this form by email to the Course Director via: npcam@tcd.ie

Guidelines on marking schemes and grades in Trinity College Dublin for external project supervisors

In Trinity College Dublin, a 1st class Honours Degree is obtained when a student's weighted overall Moderatorship mark exceeds 70%. The grade boundaries are as follows:

Degree Classification	Grade	Percentage range
First Class Honors	I	70-100%
Second Class Honors, first division	II.1	60-69%
Second Class Honors, second division	II.2	50-59%
Third Class Honors	III	40-49%
Fail	F	Below 39%

A students Moderatorship mark, and hence Grade, in Nanoscience, Physics and Chemistry of Advanced Materials degree is computed as an 65% contribution from their final, Senior Sophister, year mark and a 35% contribution from their third Junior Sophister year mark. Their final year mark is based on their research project (~30%) and their final year examinations (~70%).

The best student in the final year is unlikely to have an overall mark above 80%. A Gold Medal standard is reached with an overall mark of 75% and above.

Students typically get higher marks in the project, however, as most enjoy it are committed and put in a lot of work.

Results obtained: award a mark out of 25
For example, if the results were perfect and more results could not have been obtained in the time available you could award 25 out of 25. However, even a very good set of results would typically be awarded 20-23. Perfection is rarely attained.

Effort and Performance: award a mark out of 45
Again, hard work and high performance could take a student into the 35-40 range or, in very exceptional circumstances, higher.

Initiative and Understanding: award a mark out of 30
This is the most difficult area to score well in."Understanding" is OK, but it is often hard for a student in a short project to demonstrate a lot of initiative. A mark above 25 would be quite unusual.

Total mark:
Overall, an exceptional student might be awarded a project mark in the high 80s out of 100. A mark of 70% would be considered a very good mark. On the other end of the scale a mark of 50% or below would be considered very poor.

Categories of marks:

Please provide an appropriately detailed comment to justify the mark in each category.

1. **Results obtained:**
   Comment on the students ability to carry out experiments or measurements and acquire accurate results given the resources at their disposal and the guidance, supervision or help they received. Comment on whether primary results and conclusions were clearly presented and justified or alternatively whether communication was poor and when results and conclusions were finally extracted whether they were unclear, ambiguous and unreliable. Comment on how effective the student was in analysing these primary results and on drawing inferences from the data. Were primary results presented clearly with very little room for improvement? Comment on whether the conclusions reached during the project were justified (even if these later turned out to be erroneous!) Finally, comment on the significance of the results obtained and the success or otherwise of the project as a whole and the students contribution towards that level of success.

   Comment:

   Mark: …... /25

2. **Effort and performance:**
   Comment on how effectively the student worked, what level of verbal guidance was necessary, the level of supervision required of a practical nature whether significant, modest, or only essential i.e. where new techniques were introduced, or whether constant supervision was necessary even with common procedures and the student could not work independently. Comment on whether the student communicated with the supervisor regularly. Did the student take responsibility for the progress of the project? Was the student fully committed, spending almost all recommended time working on the project, and working very diligently during this time or only spending sufficient time in order to obtain adequate results? Did the student independently seek help when needed, specifying the problem succinctly and clearly, or did the student fail to recognise problems when they occurred and had to be prompted to recognise a problem. Was timekeeping an issue?

   Comment:

   Mark: …... /45

3. **Initiative and Understanding:**
   Comment on whether the student regularly made useful suggestions about further developments. Did the student make independent attempts to assess experimental data/theory and if so comment on how successful they were, on whether help was needed in more difficult or unusual cases or whether help was needed in all cases. Comment on the level of initiative or original ideas that the student brought to the project – did they show no initiative and contribute no original ideas? Did they clearly understand and were able to articulate the science involved in the project?

   Comment:

   Mark: …... /30

APPENDIX B: READER ASSESSMENT FORM

University of Dublin, Trinity College
NANOSCIENCE, PHYSICS AND CHEMISTRY OF ADVANCED MATERIALS
SENIOR SOPHISTER PROJECT

SECOND / THIRD READERS REPORT

Name of Student:	
Title of Project:	
Readers name:	
Date of report:	

Summary of Readers marks:

Categories	**Mark**	**Total**
Introduction/Background		out of **20**
Scientific content and results		out of **50**
Presentation		out of **20**
Conclusions		out of **10**
Total Readers mark for project:		out of **100**

Signature:	

Please return this form by email to Una Dowling, DOWLINGU@tcd.ie.

Categories of marks:

1) **Introduction/Background:** Has the background to the project been suitably outlined in the opening part of the report? Have objectives of the project been clearly explained? Has adequate background information been provided to give the reader a clear appreciation of the aims of the project?

Comment:

Mark: …... /20

2) **Scientific content and results:** Has the principal creative, investigative and/or developmental work of the project been well undertaken by the student? Have experimental procedures, analytical techniques, theory and modelling been soundly established and implemented effectively? Has the student carried out sufficient investigations to verify

his/her work? Have suitable results, whether good or bad, been presented in the report for this purpose?

Comment:

Mark: ….. /50

3) **Presentation:** Is the report well laid out and structured? Has the student presented and expressed their work clearly, concisely and effectively? Are the grammar, punctuation and spelling accurate? Are diagrams, tables and graphs properly drawn, titled and labelled? Has a suitable list of references been included?

Comment:

Mark: ….. /20

4) **Conclusion/Summary:** Has a reasonable effort been to explain results and draw conclusions? In particular, has comment been made on the overall outcome of the project and how effective it has been in obtaining its goals.

Comment:

Mark: ….. /10