UNIVERSITY OF LINCOLN

SCHOOL OF MATHEMATICS AND PHYSICS

College of Science

School of Mathematics and Physics

MTH3005M/MTH3009M

PHY3003/PHY3007

Maths and Physics

3rd Year Project Handbook

Contents

Learning Objectives

This is a double module in which a student undertakes a project under supervision of a research-active member of staff. The project can also be undertaken at an external collaborating establishment. Projects will be offered to students in a wide range of subjects, which will be assigned with account for students' individual preferences and programme of their studies.

The descriptions of the available Maths projects are presented on Blackboard. A preference form is also included on Blackboard.

Maths Learning outcomes (MTH3005)

LO1: Undertake a programme of work, without unduly close supervision, meeting agreed targets, critically analysing the results and reaching conclusions that are appropriate for the particular project.

LO2: Manage time, setting and achieving appropriate targets throughout the project, including the provision of any necessary documentation, so that the work is completed by the stated deadline.

LO3: Write a full and clear report that conforms to agreed guidelines.

LO4: Present and defend the results of the project in a viva.

Physics Learning outcomes (PHY3007)

L01: Plan and carry out an extended piece of work in physics.

L02: Analyse data, interpret and critically evaluate the results.

L03: Write a report in a scientific format.

L04: Present and defend the results in a viva.

Maths and Theoretical Physics (PHY3003)

LO1: Plan and carry out an extended piece of work envolving combination of both mathematics and physics with minimal supervision.

LO2: Analyse data, interpret and critically evaluate the results.

LO3: Write a report in a format suitable for publication.

LO4: Present and defend the results of the project in a viva.

Mathematics and Computer Science (MTH3009)

LO1 Apply practical and analytical skills in the design and implementation of a non-trivial set of project goals with minimal supervision.

LO2: Analyse, interpret and critically evaluate the results. Write a full and clear report that conforms to agreed guidelines.

LO3: Manage time, setting and achieving appropriate targets throughout the project, including the provision of any necessary documentation, so that the work is completed by the stated deadline.

LO4: Present and defend the results of the project in a viva.

Formative Assessments

Research Plan

You will be required to produce a short research plan, which will contribute 5% to the final module mark (**L02**). The research plan should be approximately 700–1000 words in length (excluding references). You will have the opportunity to discuss your plan with your supervisor in the first two weeks; this opportunity will be best taken if you have a draft proposal prepared before the meeting. Your plan should include the following:

1. The title of the project.
2. A brief description of the project.
3. The reasons for undertaking the work.
4. Connection of the project with your previous studies.
5. A description of the work previously done.
6. A survey of the literature or searches that need to be made.
7. A list of references.
8. *If applicable*: indication of the computer laboratory/area where part of the work will be carried out, equipment and facilities required, (where they exist), need to be purchased or manufactured in the workshops.
9. Likely cost of consumables required.
10. A brief action plan showing the key stages of the work to be done with approximate completion dates.
11. Ethics document (Ethics link)
12. A risk assessment wherever appropriate (compulsory for the Phy3003 and PHY3007).
13. Arrangements made for regular discussions with your supervisor.

Note that items 7, 8 and 9 may not be relevant to many theoretical/computational projects, but they could still be if high-performance computing is involved.A short literature survey should focus on the literature relevant to your project. You may ask your supervisor for some suggested starting points in terms of reading but you will not be provided with a comprehensive ‘reading list’ as such.

The Research Plan should be submitted on Blackboard. This report counts 5% towards the total module mark. I would like to remind that the project is automatically failed without an approval of the ethic document (item 11).

The item 9 has to be submitted also as appendix in the main report. This report should be submitted on Blackboard.

The following mark scheme will be used to assess your research plan:

Research Plan Marking scheme						
	Failing	**40-49**	**50-59**	**60-69**	**70-79**	**>79%**
Primary Quality	• Very poorly presented and difficult to follow. • No equations/tables or figures are present. • No evidence of reflection • No references are reported • Very Poor understanding of the project. • Very poor reflection about the objective of the project.	• Very limited analysis of the problem and difficult to follow • Some Equations/tables/ figures are present. • Limited evidence of reflection • Limited references with inconsistency of the style. • Limited understanding of the project. • Some of the objective of the project are not realistic or cannot be performed in an adequate timeline.	• Fair attempt at a logical structure using standard format. • Fair use of equation/diagrams/table s and their presentation. • Fair range of key references used and presented in a standard style with only minor inconsistencies. • Fair understanding of the project. • Fairly good timeline of the objectives.	• Generally, coherently, and well structured (date, section, title, page numbers, eq. number etc). • Good use and presentation of the equations/diagrams/tables. • Good range of key references used and consistently in a standard style. • Good critical analysis and good reflection on the significance of the project. • Good proposal and realistic timeline of the main objectives.	• Generally, coherently and well structured (date, section, title, page numbers, eq. number etc). • Very good use and presentation of the equations/diagrams/tables. • Very good range of key references used and consistently in a standard style. • Very good critical analysis and good reflection on the significance of the project. • Excellent proposal and good timeline of the main objectives of the project.	• Excellent presentation and use of equations/diagrams/tables. • Wide range of key references used and presented accurately and consistently in a standard style. • Clearly developed, showing a thorough understanding of the theory behind the project. • An excellent critical and concise reflection on the significance of the project. • Outstanding proposal with ambitious objectives in a good timeline frame.
Secondary feature	• Matches very few of the primary criteria • Major weaknesses in subject knowledge • Weak attempt to answer the question with no cohesion	• Meets all primary criteria • Incomplete subject knowledge with major gaps or omissions • Clear lack of cohesion and poor structure	• Meets all primary criteria • Adequate subject knowledge but with some gaps of omissions • Some lack of cohesion leading to poor structure in places	• Meets all primary criteria • Strong subject knowledge but with some gaps or omissions • Broadly cohesive and comprehensive piece of work	• Meets all primary criteria • Minor gaps in knowledge may be present • Cohesive and comprehensive piece of work	• Exceeds expectations for most primary criteria • Complete command of subject and other relevant areas • Extremely cohesive and comprehensive piece of work

Weekly supervisory meetings and logbook

You will have the opportunity to meet with your supervisor for 30 minutes every two weeks, at a scheduled time and location. Lost contact time cannot be carried over to later weeks (unless there are extenuating circumstances backed by appropriate forms).

A proportion (15%) of your total module mark will be determined by assessment of your logbook.

Your logbook should be used to make record of all work that you undertake during the project. This entails dated entries, more than once a week, whenever you read a book section or an article, perform a calculation, learn a new piece of theory, exercise in solving a problem, make notes, prepare questions that you intend to ask the supervisor, etc. The logbook should be clearly written allowing (for example) another student to continue your project from where you have stopped.

The logbook must be in A4 paper format and physically brought to every supervisory meeting. It is the responsibility of the student to ensure the supervisor signs and dates the logbook after each meeting. Failure to document the meeting and obtain the signature will be viewed as a lack of organization and time management, and will be appropriately reflected in the professionalism assessment in the final grading scheme report. It is the student's duty to arrive prepared for the meeting and to promptly inform the supervisor of any missed meetings. Students are strongly advised to make regular scans of the logbook to guard against loss or misplacement. Additionally, the report should be saved routinely on OneDrive to prevent potential complete loss over the course of the academic year.

The guidelines for the logbook assessment are as follows:

Logbook Marking scheme						
	Failing	**40-49**	**50-59**	**60-69**	**70-79**	**>79%**
Primary Quality	• No evidence of a logical structure. • Very poorly presented and difficult to follow. • No equations/tables or figures are present. • No evidence of reflection • No references are reported • No evidence of future work • Very Poor understanding of the problem.	• Limited evidence of coherence or structure • Very limited analysis of the problem and difficult to follow • Some Equations/tables/ figures are present. • Limited evidence of reflection • Limited references with inconsistency of the style. • Limited evidence of future work. • Limited understanding of the problem.	• Competently written with only minor errors of grammar and spelling • Fair attempt at a logical structure using standard format. • Fair use of equation/diagrams/tables and their presentation. • Fair range of key references used and presented in a standard style with only minor inconsistencies. • Evidence of future work. • Fair understanding of the problem.	• Good presentation skills with good analysis of the problem • Generally, coherently and well structured (date, section, title, page numbers, eq. number etc). • Good use and presentation of the equations/diagrams/tables. • Good range of key references used and consistently in a standard style. • Good presentation about the future work and clearly linked with the previous work. • Good critical analysis and good reflection on the significance of the results/problem	• Very good presentation skills with good analysis of the problem • Generally, coherently and well structured (date, section, title, page numbers, eq. number etc). • Very good use and presentation of the equations/diagrams/tables. • Very good range of key references used and consistently in a standard style. • Very good presentation about the future work and clearly linked with the previous work • Very good critical analysis and good reflection on the significance of the results/problem.	• Outstanding presentational skills showing an accurate and fluent analysis of the topic or problem. • Excellent presentation and use of equations/diagrams/tables. • Wide range of key references used and presented accurately and consistently in a standard style. • Clearly developed, showing a thorough understanding of the theory behind the project. • Excellent reflection about the future work linked exceptional well with the previous work. • An excellent critical and concise reflection on the significance of the results/problem.
Secondary feature	• Matches very few of the primary criteria • Major weaknesses in subject knowledge • Weak attempt to answer the question with no cohesion	• Meets all primary criteria • Incomplete subject knowledge with major gaps or omissions • Clear lack of cohesion and poor structure	• Meets all primary criteria • Adequate subject knowledge but with some gaps of omissions • Some lack of cohesion leading to poor structure in places	• Meets all primary criteria • Strong subject knowledge but with some gaps or omissions • Broadly cohesive and comprehensive piece of work	• Meets all primary criteria • Minor gaps in knowledge may be present • Cohesive and comprehensive piece of work	• Exceeds expectations for most primary criteria • Complete command of subject and other relevant areas • Extremely cohesive and comprehensive piece of work

Summative Assessment

Scientific report

The primary assessment of this module will be a scientific report, to be submitted at the end of your project (see deadline in the assignment deadline spreadsheet). This should be presented in a similar format to the scientific report you used for producing the 2nd Year Group Project. A good report will typically be about 35–45 pages. The report cannot have more than 50 pages (excluding Appendix and references). A penalty of 10% will be applied with the submission of a report with more than 50 pages (excluding appendix and references) and 10% penalty will be added for every 5 more pages above the total (for example: 55 pages will have a penalty of 20%).

3rd Year Project Handbook

	Fail - (0-39)	Third - (40-49)	Lower second - (50-59)	Upper second - (60-69)	First - (70-79)	High first - (80-100)
Abstract, aims and objectives	• No abstract or aims/objectives	• Abstract is evident; aims and objective evident	• Abstract is relevant to the project; aims and objectives are clearly described	• A well written abstract that is relevant to the project; aims and objectives are clearly described, are appropriate and achievable	• A concise, well-written abstract, that is relevant to the project, details main outcomes, and sets project set into context; aims and objectives are well directed, ambitious and achievable, with appropriate deliverables	• Abstract and aims/objectives are the standard of a published paper
Presentation Skills	• Report is very poorly presented	• Report is adequately typeset	• Report is consistent; figures are sufficient quality; equations are typeset to a sufficient standard (e.g., Latex)	• Report is consistent and logically presented; figures include captions and are well labelled; equations are well typeset, and notation described; language style and grammar are of a good standard	• Report is consistent and logically presented with appropriate subject headings to guide reader; figures are excellent quality and referenced correctly; equations are correctly typeset, well-labelled and cross-referenced correctly and notation is correctly described; language style is fluent and sophisticated	• Report is the presented to the standard of a published paper
Background Theory and References	No evidence of background research	• Evidence of background research; some references cited	• Evidence of background research into a topic appropriate for 3rd year level; some understanding of background theory; relevant references cited	• Detailed background research into a sufficiently challenging 3rd year topic; clear understanding of background theory; fair insight into the literature; range of relevant references cited appropriately; bibliography typeset correctly	• Comprehensive background research into a complex 3rd year topic; thorough understanding of background theory; excellent insight into the literature which is referred to throughout report; a wide range of relevant references are cited appropriately; bibliography is typeset to a high standard	• The depth and breadth of the background research is the standard of a published review paper.
Analysis and Interpretation of the Results	• No evidence of results	• Results are communicated fairly; various information is considered	• Results are at satisfactory level for 3rd year and are well communicated; a range of information is evaluated; arguments are logical	• Results are well developed for 3rd year level and are communicated to a high degree of proficiency; a range of information is critically analysed; arguments are coherent and substantiated with supporting evidence; thoughtful interpretation of results	• Results are involved and elaborate for 3rd year and are communicated to an accomplished level; complex information is analysed to an advanced level; arguments are well developed, substantiated with supporting evidence, and compared to literature results; perceptive interpretation of results in a wider context	• Results are exceptional and have the potential to be published.
Conclusion and Future Work	• Conclusions are inadequate	• Conclusions are relevant to the project aim	• Conclusions provide an adequate summary of the project; evidence of future work	• Conclusions provide a detailed overview of the research and the main results; clear ideas on how the project could be extended	• Conclusions link together aims, methodology, and main results; project is put into wider context; detailed description of various ways to extend the work	• Conclusions communicated exceptionally; future work is discussed in the context of the research landscape
Content and Creativity	• Content is inadequate	• Content is relevant to degree programme; some creativity demonstrated	• Content is suitable level of difficulty for 3rd year; creative work is evident	• Content covers sufficient depth/breadth at a level of difficulty appropriate for 3rd year; creativity is demonstrated throughout the report	• Content is sufficiently advanced for 3rd year, demonstrating both depth and breadth of research; excellent creative flair and originality	• Content goes beyond the level expected for 3rd year; standard of research is that of a published paper.
• **Professionalism** Student behaviour and actions to be considered over the course of the project including: engagement, organization and planning, communication.	• Student has not engaged and been unable to manage any aspect of their project independently.	• A student that has made limited effort to manage their project and has needed considerable assistance to plan/ meet deadlines and communicate.	• A student that has engaged but needed considerable assistance to manage their project to meet deadlines/ plan work and/or has been weak at communicating	• A student that has needed some prompting to meet deadlines, who has not been fully organized and has been unclear in their communication.	• A professional and engaged student who has met most deadlines, taken responsibility for planning and organizing project and communicated effectively.	• An excellent engaging student who has met all deadlines, taken full responsibility for planning and independently organizing project and communicated effectively.

Notes on Presentation

1. General

The typing of the report is the responsibility of the student. The report must be word processed (LATEX recommended, a template will be provided on Blackboard) and laser printed (two-sided, or one-sided). Please conform to the following style.

- Use Times Roman Font or any other Font consistently through the report (for example Arial - if you are unsure about which font you can use please contact your module coordinator)

- Use font point size 16 bold for Chapter headings.
  Use font point size 14 bold for Section headings.
  Use font point size 12 for normal scrip.

- Use top and bottom margins of 1 inch, and both left and right margins of 1.25 inches.

- **Justify on both left and right margins.**

- Use headers and footers as appropriate. Number every page in the centre at the bottom.

- Use 1.5 line spacing.

- Use spelling checker.

2. Structure of the report

2.1 Electronic submission

The title page (first page) with all info including your name will be visible on the first page of your report. If using another type of cover, **please make sure your name is visible on the first page.**

2.2 Title Page

A template/example for the title page will be provided on Blackboard.

2.3 Abstract (max. 150 words)

States the main features and results of the work (without many formulae or references).

2.4 Table of Contents

2.1 Introduction

The introduction should describe the objectives of the project, the background and review the literature.

2.2 Chapters on the main body of study/work

These should be arranged in a logical order depending on the nature of the project. These should also include **Discussion of results,** where **t**he results and methods of your study should

be critically evaluated, as well as compared with other results and methods known in the literature.

2.3 Conclusion

A summary of the results and studies and an indication of further work or studies.

2.4 Acknowledgements

It is good manners to thank and acknowledge the contribution made by your supervisor, administrative staff, computer technicians, etc.

2.5 Appendices

Appendices can be used for bulky proofs or computer programs which would obscure the understanding of material presented in the main body of the report.

You must include your Research Plan in your appendices.

2.6 References

The text of your report should include citations indicating where specific information comes from. In addition, the full bibliographic details must be given in the bibliography list at the end.

References should contain the following information:

1. Author
2. Title of book or article
3. Title of the journal
4. Volume number
5. For books: publisher, publisher's address
6. Year of publication
7. Page numbers

Bibliography must be done using IEEE style (if Microsoft word is used). The web-references should be not more than 30% of the total number of references. Wikipedia website should not be used as a reference. If IEEE is not available any numerical references similar to IEEE (for example Vancouver style) can be used.

2.7 Figures and Diagrams

All figures or diagrams should have a Figure number and caption. If the diagram is from a published source, the caption should also contain the acknowledgement and reference.

3. Submission.

You must submit the final report on Blackboard.

The report will be checked for plagiarism using the latest software.

PLAGIARISM – don't do it!

"Plagiarism" refers to an author using the work of others in a report, article, book etc. as if it is the author's own work.

You must not plagiarise the work of others in your report or any other documents.

You must always reference the work of others.

Don't commit even accidental plagiarism by forgetting to reference.

Viva examination

The viva defence of your report will be carried out by your supervisor and an 'external' examiner who will be an academic member of staff. The viva will last for approximately 40 minutes. It will begin with you giving a short (2-3 minutes) summary of your project, aimed at a non-scientific audience. You will then be asked to give a more thorough presentation of your results (10–12 minutes). The remaining time will be allocated for a discussion between yourself and the two examiners. The purpose of the viva is to test your knowledge of the subject, to confirm that you have undertaken the project work yourself and that you understand the material that you studied (**L04**). Your defence will be judged on the following criteria, each section being equally weighted:

Viva	**Bad Fail**	**Marginal Fail**	**III**	**IIii**	**IIi**	**I**	**High First**
Ability to summarize project (3 minutes)							
Comprehension of the background material							
Understanding and interpretation of the results of your studies							
Ability to answer questions							
Ability to suggest improvements and/or extensions to the project							

Total Mark Breakdown

Semester 1

Component	Percentage of total mark	Submission Deadlines
Research Plan	5%	26/10/2023
Weekly supervisor meetings and draft submission	0%	2/11/2023

Semester 2

Component	Percentage of total mark	Submission Deadlines
Logbook submission	15%	1/02/2024
Draft Report (non-compulsory)	0%	27/02/2024
Final Report (R)	80% $\sqrt[\frac{1}{3}]{R \cdot R \cdot V}$	R-Week 30 P-Week 34
Viva (V)		