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School of Physics and Astronomy

Module Handbook for

MSci Natural Science and CMP Physics Research Project

PHYS4024

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Module Convenors:

Prof Tony Kent
(anthony.kent@nottingham.ac.uk)

Dr Keith Benedict
(keith.benedict@nottingham.ac.uk)

Prof Michael Merrifield
(michael.merrifield@nottingham.ac.uk)

Dr Alexey Potapov
(alexey.potapov@nottingham.ac.uk)

Prof Anne Green
(anne.green@nottingham.ac.uk)

MSci Physics Research Project

Aims of Module:

To expose you (the students) to a realistic problem-solving environment where you are expected to work intensively on a physics-related project, meet deadlines, present your work orally and produce a comprehensive final report.

Objectives:

On completion of the module, you should be able to:

(a) focus a range of knowledge and skills on the solution of a real research problem

(b) describe and present technically sophisticated material in a clear, logical fashion

(c) manage their time to meet strict deadlines

(d) gather information using the library and other IT resources

(e) work in a group and to adapt to unfamiliar environments

(f) present their work orally

(g) keep a comprehensive laboratory notebook/project diary

(h) produce a detailed but concise final report to a tight deadline

(i) follow safety procedures and keep appropriate records

Introduction

The Physics Research Project module is an important element of your M.Sci. undergraduate training. It is your opportunity to practice your professional physics skills and to apply the knowledge you have acquired during your time as an undergraduate to solving a novel physics problem. Projects are provided by research groups within the School and by external organisations. All involve real problems in the sense that all projects contain a significant element of 'discovery' and innovation. Furthermore, someone has a genuine interest in their solution. You will be investigating new pieces of physics that have not been studied before.

There is a strong element of *Research* so it is in the nature of these projects that there will not necessarily be a well-defined end. Even where there is, students may not be able to provide a full solution in the time available. However, credit will be given for an intelligent approach to the projects, an appreciation of the basic physics and, naturally, a comprehensive and informative final report.

Project Preferences

The details of each project on offer are online on Moodle. As you will see, there is a wide range of activities available. Teamwork is an important element of the module so normally the project groups will involve pairs, but sometimes groups of three or four students may be required, perhaps split into two sub-groups that work on different aspects of the project. However, occasionally it may be appropriate for a student to work alone on a project; if this happens then we shall endeavour to build some team-working aspects into the project in different ways, perhaps interacting with members of the wider research group to which you are assigned.

Although you are not given the opportunity to choose your project, you will be invited to express a preference (see back page for form). The final decision of who does what will

be made by the module convenors but we shall make every effort to ensure that students are allocated one of their 'top choice' projects.

Project Supervisor

Each project has a contact in the research group or organisation; this is your *project supervisor*. Normally this is the person who has proposed the project and you will meet them for the initial meeting where the specific details of your project will be explained. The degree to which this person is involved throughout the year will depend on the project and whether the project is with an internal research group or with an external organisation. If the project is with a School research group then your project supervisor is the person with whom you should discuss specific, specialised aspects of the project on a weekly or perhaps fortnightly basis. If the project is with an external organisation then meetings will probably be less frequent but you will also be assigned to a member of the academic staff who has expertise in the project area and who will be available locally for physics discussions.

Your project supervisor will guide you in the conduct of your research project. However, at this advanced stage of your training we will be looking at your performance as a professional physicist, including your originality, organisation and industry. You must be prepared to take responsibility for making your project decisions, informed as necessary by discussions with experienced researchers. You will not be penalised for asking questions and interacting within a research group setting, but don't expect others to make all the decisions for you.

Your project supervisors will participate in the marking of the Literature Review and Plan but they will not be formally involved in the grading of the final reports or other assessments. Supervisors will be invited to provide more general feedback to the module convenors on the conduct and progress of the project by the students.

You will be meeting your project supervisor on a regular basis and they will be in a position to provide additional support to your personal tutor, for example, writing job references.

Module Supervisor

In addition, each project is assigned a *module supervisor* who is one of the project module convenors (Prof Tony Kent, Dr Keith Benedict, Prof Michael Merrifield, Dr Alexey Potapov and Prof Anne Green). This staff member will be responsible for monitoring the general progress of the project and ensure the smooth running. They will take a keen interest in your project but they may not necessarily have the specialised knowledge of your Project Supervisor. They will be available for consultation throughout the year to discuss the project and to ensure (for example) project diaries and safety information are kept up-to-date. In order to ensure marking standards are consistent across all projects, the module convenors will be the staff responsible for grading your formal assessments. They are usually the staff who will return feedback on your assessments.

Moodle web pages

The web pages for the project will be maintained on Moodle. Here you will find a great deal of information about the structure and organisation of the module. You will find the downloadable forms you need, for example safety forms, as well as documents that describe and which are important to the assessments. The timetables for the presentations and interviews will be published on the Moodle pages.

Commercial sensitivity and Intellectual Property

A final but important point is that of commercial sensitivity. Since some of the projects involve commercially active companies, **all material must be treated in the strictest confidence**. Leaking of material to a third party, even inadvertently, may lead to serious consequences including, in extreme cases, prosecution. Where appropriate, students are bound by a Disclosure Agreement between the University and the sponsoring company or organisation. Also, each student is responsible for his or her own behaviour and should be aware they are representing the University

Timetable and Assessment

The Research Project module is 60 credits in total and year-long so it forms one half of your final year. You should manage your time and workload accordingly.

There are several deadlines and formal assessments throughout the year, beginning in the autumn semester. The timetable on the following page shows these where the deadline dates are emboldened. Project plans, literature reviews, diaries, final reports and electronic supplemental material should be uploaded electronically via *TurnitIn* and Moodle – we shall provide specific instructions in advance of the respective deadlines.

Relevant documents about the day to day running of the module will be uploaded to the module pages on Moodle. Timetables for the interviews and presentations will be published about 1 week in advance. In almost all cases, email to your university account will additionally be used to provide further information and to notify you of timetables or any changes.

Briefing Sessions

There will be briefing, and question and answer sessions arranged ahead of deadlines for major elements of assessment. The time and location of these are in the timetable. Their purpose is to provide information and guidance as to what is expected for these assessments and supplements the information in this handbook.

PHYS4024 Project Timetable

Date	Time-table Week	Assessment	Marks %	Notes
29/9/22	2	Introduction to the Physics Research Project		11:00 B23
05/10/22	3	Preference form deadline		Online submission via Moodle by 5pm
17/10/24	5	Projects allocation meeting and guidance on notebooks		10:00 UP-POPE-C14+
18/10/22 – 11/11/22	5 - 8	Background material. Planning and literature review		Discussions with project supervisor, background reading and planning
31/10/22	7	Background and literature review writing Q&A session		15:00 B23
11/11/22	**8**	**Project Background and Literature Review**	**15%**	**Assessed individually**
11/11/22	**8**	**Project Plan and risk assessments**	**5%**	**Assessed jointly where relevant**
11/11/22	**8**	**Project Diary/Notebook (interim assessment)**	**3%**	**Assessed individually**
14/11/22 – 5/5/23	9 - 33	Project work		
21/2/23	23	Presentation and viva briefing and Q&A session		15:00 UP-POPE-A14+
In week 27/2/23	**24**	**Formal Presentation**	**10%**	**Assessed jointly where relevant**
In week 6/3/23	**25**	**Formal Interview (Viva)**	**8%**	**Assessed individually**
30/3/23		Report writing briefing and Q&A session		15:00 UP-LIFESCI-A35+
5/5/23	**33**	**Project Diary/Notebook and Raw Data**	**14%**	**Assessed individually**
5/5/23	**33**	**Formal report**	**45%**	**Assessed jointly where relevant**

Marking Guidelines

The Style-Guide of the School of Physics & Astronomy

A style guide entitled '*Guidance on Writing and Formatting Reports and other Written Physics Articles*' has been produced by Dr Mellor. This gives consistent guidance on preparing written work in all years of study in the School of Physics & Astronomy. Students should read this document and adopt the guidance in preparing their submitted written work for this project module. A copy will be available via the Moodle web pages.

Additional guidance specific to this module is given below.

Important note about your submitted written work: *you may consult your project supervisor for general guidance on the structure and content of your written work or report but it is not reasonable to expect them to read a draft and comment in detail.*

Bibliographical References – general comments

In writing reports and literature reviews, the sources of your scientific statements, derivations, mathematical expressions, scientific data etc, must always be fully referenced in a bibliography. In a project of this nature, it is not acceptable to use web-sites as a primary source of information. While accepting that much valuable information is available and may be consulted, only peer reviewed articles in recognised academic journals and books are acceptable as references. Further, it is important to identify published material from your own work and citations will help you achieve this: see further comments on 'Plagiarism' below.

We advise you to consult published papers in the academic journals to gain a full appreciation of the standards required in citing the scientific literature.

It is not always necessary to include the full title in the citation, but it can be helpful to the reader if it is included. Different journals have slightly different citation formats; you should adopt your chosen format consistently throughout your assessed work.

Notebooks and raw data (17%)

It is essential that each student in the group keeps a comprehensive diary/notebook of what they are doing throughout the project. Each entry should appear under the correct date. The notebook should also include cross references to other forms of raw material (e.g. digital data in computer files, results of literature searches etc). Your diary/notebook should be maintained in electronic form and we recommend you use One Note. If you have a tablet with a pen, you can handwrite the notes directly into One Note; alternatively you type them in, like a word processor; or scan handwritten notes and sketches into the One Note file using an application like Microsoft Lens. Project notebooks are important for experimental and theoretical/computational projects alike. Project notebooks must be submitted for assessment at two stages: the end of the first semester along with the plan and background (3%) and at the end of the project along with the final report (14%). For submission, it should be converted to a SINGLE Adobe Acrobat (.pdf) file. It is your responsibility to maintain backup copies of your project diary, loss of content due to the loss or failure of the device it is kept on will not be considered a valid extenuating circumstance.

Project Background and Literature Review (15%) and Project Plan (5%)

This piece of assessment will comprise two elements; a) a detailed project plan which is assessed jointly and, b) an individual piece of written work describing the scope of your project, the background physics and, in the context of your plan, a description of the methods (theoretical, computational and experimental) you will use to tackle your project. A review of the relevant literature should be incorporated within this written work.

Project Plan (5% joint)

The plan will be written jointly with your project partner. This assessment is designed to demonstrate that you have understood the scope of your project and that you have

devised an effective series of 'work packages' that define the activities you will undertake to drive the project to a successful conclusion. Begin with a brief summary of the project aims and objectives, then elucidate the different work packages in which you will be engaged, identifying team and individual contributions. Alongside, you are advised to devise an outline timetable of activities and present this in the form of a Gantt chart. Incorporated in your plan should be a 'costing' in terms of the research resources required, e.g. equipment, computer hardware and software and your own time.

An important aspect of your project concerns Health and Safety; your safety and the safety of others is paramount. You are required to discuss safety aspects with your project supervisor. As part of your plan you should show that you have understood the safety requirements and made appropriate plans for mitigating any risks. Guidance has been given at the induction meeting, in the Project Safety section in this booklet, and on our Moodle page.

The plan element should comprise no more than two sides of A4 plus the Gantt chart. Additionally, you will be required to submit appropriate 'Health and Safety' documentation, comprising scans of completed risk assessments and other necessary safety forms.

Project Background and Literature Review (15% individual)

Each student is expected to independently write and submit their own Review. It should begin with a concise summary of the project you have been set, then broaden to describe the background physics and the methods you will use in conducting the project. Incorporated in your written descriptions should be appropriate references to the published scientific literature, both books and journal papers. This 'referencing' can take a number of forms; for example, references to original material where experimental techniques are described, or mathematical expressions defining the background physics are derived. Additionally, it will encompass a 'Literature Review' outlining the current state of knowledge in the published literature; what papers, past and recent, have been published that are directly relevant to your project? Use this to demonstrate you have read widely and have a good acquaintance with the scientific literature. Show that, in the context of the project you have been set, you know and understand the work conducted by your own research group and groups outside who work in a closely similar area.

This assessed piece of work should be no longer than about 1500 words, or about 6 or 7 pages including figures, but not including the reference citations. We shall not define a precise template for the structure or length of the Review because it will depend on the precise nature of your project; the portfolio of projects undertaken by students registered for this module encompasses a broad range of physics activity and there is no global 'right answer' that applies to all. However, this piece of assessment will be co-marked by your project supervisor, who will be well placed to know whether you have succeeded in describing the project well, have demonstrated a good understanding of the underlying physics concepts and have shown good evidence for reading the relevant literature. As professional physicists, you will have primary responsibility for devising the best structure for your Review and presenting it in a way that is most appropriate to your particular research problem.

Presentation (10%)

Marks will be split evenly between the content and the quality of the delivery of your presentation. Each student should speak for about 5-7 minutes (i.e. a presentation given by a pair lasts 10-15 minutes total) explaining the nature of the project and their progress to date. Students should be prepared to answer questions to demonstrate their understanding. Feedback and marks will be provided in the week following the presentations when the module supervisor will also be available to provide additional verbal feedback if requested.

The marking criteria will be made clear in the marksheet available on the Moodle page. A good presentation will always hinge on the quality of the slides. Do not make the mistake

of putting too much material on each slide. Include no more than can reasonably be read in the time for which it is visible, remembering the audience will need to simultaneously absorb the verbal explanation. It sounds obvious, but the material on the slides should provide a visual aid to the verbal explanation and be complementary. Good, well-prepared slides will help the presenter give a good talk. As a presenter, it can be a struggle to give a good talk around poorly prepared slides. Do not make the mistake of simply dictating what is written in the slide. Make use of graphics where appropriate to explain the physics concepts; in the context of a presentation a graphic will often convey a better understanding to the audience than many lines of text. When describing mathematical content be careful about trying to include too many equations at once – be selective; it's not necessary to include every detail of a derivation but concentrate on the key equations, finding ways to identify and explain the pivotal physical concepts that underpin the mathematical expressions. Where appropriate any references to published papers should appear on the slide to which they relate, not collected together at the end of the talk.

Clear, well-prepared slides, good preparation and practice will help you to give a confident presentation with the appropriate pace and volume. Confidence will help you establish a good rapport with the audience. The ambience should be one of engagement between the presenter and the audience.

A data projector will be available for presentations. Although the computer and display is usually reliable there are sometimes some hardware incompatibilities so it is always advisable to check presentations will load and display correctly on another computer. Avoid special fonts and effects, plus, to be on the safe side, ensure your presentation is compatible with the standard version of PowerPoint that is installed on university computers or use a pdf version of the slides.

Formal Interview (Viva) (8%)

The formal interview will be conducted with students individually. It will comprise questions based on your presentation in the previous week as well as giving students the opportunity to give a verbal account of their progress to date. Marks will be awarded for understanding, for a clear appreciation about the direction of the project, the progress made and for the clarity of explanation. The marking criteria are made clear on the marksheet provided on the Moodle page.

Formal Report (45%)

The bulk of the marks are awarded for your final report. This should be pitched at the level of a Master's student working in your specialist research area. Each group has the choice of whether to submit the final report jointly or individually. The convenors strongly advise that joint reports be submitted as this will avoid duplication of effort. When a joint report is submitted it must be with the full agreement of all parties. Every report submission should include an independent statement from each student indicating his or her contribution *and the contribution of his or her partner's in the conduct of the project and the writing of the report*. A form for you to use is available in electronic form on Moodle. You should highlight particular intellectual, creative and practical aspects related to the project itself. You should indicate the chapters or sections of the report where you had a major input (the writing as well as the practical work). The statement should be signed and placed in a sealed envelope and submitted with the report. However, team work is still the essence, so this is not a competition between you and your project partner! For example, you should always proof-read each other's work. The report should also be coherent and consistent throughout.

We expect the majority of you will be submitting joint reports and for these we expect the word count to be around 10,000 words. This should translate into a report which is no more than about 40 – 45 pages long including figures, references, abstract, etc. Further guidance will be provided nearer the submission date and if you have any questions you may also ask your module supervisor.

For students who will be writing individual reports, more often because they conducted the project individually, the word count may be less, but given you will need similar

introductory sections etc, we expect your report should be around 30 pages including text, figures, references etc.

Use the School's style guide to structure your report, as discussed above. However, the requirements of this M.Sci. report are a little different to the reports you will have written in your third year. Your M.Sci. final year report will be more in the style of a mini-thesis so you should organise your work into Chapters with sub-sections. Appendices should be used sparingly and only where relevant. Where appropriate you may submit electronic appendices, for example to show a video that is produced as part of your work.

As explained earlier, because of the diversity of projects there is no global 'right answer' and we will not be defining a precise template for your final report. We always mark the project in the context of the project you have been set and its constraints, including whether it is a joint or individual project.

We will not impose a very strict limit on word count, because this may depend on the project. However, you must avoid making your reports excessively long because it is highly likely that the quality will suffer if you do so. Do not pad out your report with unnecessary background material or you will run the risk of it being downgraded. You will need to present some relevant introductory material, but you do not need to repeat your literature review that was assessed earlier. A well-structured short report will attract a higher mark than one which is overly long. Ensure your report emphasises the work you and your partner have actually done. One of the skills we shall be assessing will be the ability to present your work within acceptable space limits, both textual and graphics. You should carefully think about how you present your figures; rather than providing a series of similar and related graphs, consider whether there is scope for combining data in one graph, or using insets. Professional scientists often have to present their work within defined space limits, e.g. when publishing in Physical Review Letters, Nature, Science etc, so have a look at the scientific literature to get some ideas.

Your final report is a valuable document recording an intense period of original work – therefore you should make every effort to ensure your presentation is as professional as you can, including a suitable title sheet.

You should submit your report electronically using *TurnItIn* on Moodle; detailed guidance will be provided nearer the submission date.

Important note: you may consult your project supervisor for general guidance on the structure and content of your report but it is not reasonable to expect them to read a draft of your report and comment in detail.

Final Report Assessment

A blank mark summary sheet will be provided on the module's Moodle page, showing how the marks are awarded for the notebooks and the final report. 'Project Quality' will assess the imagination and originality of the students in conducting the research, evidence for industry, organisation of the project and the quality of the research carried out. The 'Report Content' will assess the quality of the writing and presentation in the final report; the understanding shown of the theory, method and techniques; the quality of the analysis shown in the discussion and conclusions; technical aspects such as the clarity of figures, organisation of the report, referencing the literature and the abstract.

Your final report and project notebooks will be double marked by two of the four module convenors. Starting from these initial marks, a process of moderation and arbitration will be used by the team of four markers to arrive at the final marks to be awarded to each student, ensuring uniformity of marking standards between all of the projects.

As part of the assessment procedures, project supervisors will be asked to provide written feedback that will be made available to students on request after the examining board. Supervisors will not be expected to provide numerical input to the assessment process. However, their comments will assist in the moderation of the marks awarded

ensuring that all relevant information is available to the module convenors and that standards are applied equally to all projects and to all individual students.

For a joint report, as part of the moderation process and where appropriate, the marks awarded to each student may be adjusted by a weighting factor to reflect different levels of performance by the individual students. The justification for this weighting will come from all the evidence obtained from other formal assessments, your own and your partner's statements, together with feedback from the project supervisors etc. This will ensure that the marks awarded to each student fairly reflect the contribution they have made to their project.

Professional Conduct, Teamwork and Plagiarism

You are expected to conduct yourselves professionally in carrying out your project and in your written work.

The School takes plagiarism, or any other form of cheating, very seriously and anyone suspected of committing an offence will be reported to the University Academic Offences Committee. You are encouraged to refer to the section on "Academic Offences" in the University Regulations. Particularly important: a) all experimental and computational results must be original; fabrication of results is a very serious offence indeed; b) it is essential to refer correctly to original sources of information; all verbatim and all derived material should be adequately referenced; c) claiming another person's work as your own is a very serious professional offence for all scientists.

However, it is important not to confuse plagiarism and teamwork. The majority of students will be working in groups. We believe that the teamwork in the conduct of the project is a very important aspect of the training. However, some elements of assessment are individual, for example the Literature Review, so in their writing these should represent the work of the individual student alone. In the case of a joint report, the work represents a joint effort and work you and your partner have done will not be considered as plagiarism. However, it is important that the intellectual and practical aspects of each student's work are identified in the individual statements that you are required to submit along with your report. This information will be used along with the statements of projects supervisors and other sources in deciding the final assessments.

Do not worry about self-plagiarism being detected between your Literature Reviews and your Final Report – we shall exclude your earlier work from the 'TurnItIn' analysis. In any case note: if you are concerned about extensive overlap between the two you may have misjudged the content of your Final Report; the latter has a different role and different priorities to the Literature Review.

Marking Standards

In all cases there will be an assessment of the quality of the work submitted or presented and the quality of the scientific progress and understanding. The marking and 'feedback' forms that are used for each element of assessment can be found on the Moodle web pages; you will find these useful in structuring and writing your work. Guides to the marking criteria are given below and form the basis on which marks will be allocated for the various components. Items marked in italics are particularly important.

Presentation. Credit will be given for:

A clear logical argument.

Accurate grammatical constructions.

Clear and well chosen illustrations.

Adequate captions for all figures which allow them to be understood independently and to be referenced from the text.

A sensible partition into sections, including a general introduction and a discussion.

Choice of clear print format and layout of text.

Use of simple, clear English (not American English) with the minimum of jargon. All acronyms must be defined.

Comprehensive list of references which are cited from the text.

Sensible use of appendices where appropriate for non-essential mathematical detail etc.

Clear and informative abstract.

Indication of future work.

Matching to allocated word/time limits.

Science. Credit will be given for:

A demonstrable understanding of the fundamental science involved.

An appreciation of the nature of the problem.

A realistic approach to the problem.

Imagination and flexibility of approach.

Evidence for independence of thought and action.

Evidence for industry and hard work.

Sensible division of labour within the team and evidence of planning.

Ability to work in a team.

Decisiveness.

Good experimental/theoretical technique.

Critical analysis of theoretical and experimental results.

An awareness of safety issues.

Evidence that the views of the project contact(s) have been considered.

The following tables summarise some of the attributes that characterise the different grades. Feedback for the various components will be provided in written form and, where appropriate, orally.

Background and literature review

Introduction and summary

90	Detailed feedback will be provided
80	The introduction gives an outstanding overview of the problem, and outlines the main purpose of the literature review. The summary provides an outstanding synopsis of the main points presented.
70	The introduction gives a very good overview of the problem, and outlines the main purpose of the literature review. The summary provides a very good synopsis of the main points presented.
60	The introduction gives a satisfactory overview of the problem, and outlines the main purpose of the literature review. The summary provides a satisfactory synopsis of most of the main points presented.
50	The introduction does not give a complete overview of the literature review. The summary does not completely summarise the main points of the report and many of the main conclusions are missing.
40	No introduction and/or summary is provided.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Understanding

90	Detailed feedback will be provided
80	The student shows an outstanding understanding of the physical principles underpinning their project.
70	The student shows a very good understanding of the physical principles underpinning their project.
60	The student displays a satisfactory level of understanding of the physical principles underpinning their project. The work reveals some gaps and minor misunderstandings of the physical principles behind the project.
50	The student displays an incomplete understanding of the physical principles underpinning their project.
40	The work displays an inadequate understanding of the physical principles behind the project.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Bibliography

90	Detailed feedback will be provided
80	The report contains an outstanding summary of the current state of knowledge in the field. References are provided for each subtopic of the project.
70	The report contains a very good summary of the current state of knowledge in the field, and is described in an appropriate amount of detail. All the essential references are provided.
60	The current state of knowledge in the published literature is satisfactorily described, but there are some gaps in the bibliography and/or too much detail is given in some areas. The report contains a small amount of irrelevant material.
50	The report contains an incomplete summary of the current state of knowledge in the field. The report contains unnecessary/irrelevant material.
40	The report contains an inadequate summary of the current state of knowledge in the field.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Language and structure

90	Detailed feedback will be provided
80	The language and structure of this report are outstanding. It has a logical structure with appropriate sections and flows outstandingly well. The figures and captions are all clear, well constructed, and informative. The spelling and grammar are near-perfect.
70	The language and structure of this report are very good. It has a mostly logical structure with appropriate sections and flows smoothly. The figures and captions are mostly clear, well constructed, and informative. The spelling and grammar are very good.
60	The language and structure of this report are satisfactory. The report would be easier to read if the logical flow and structure were improved. The figures are reasonable and mostly well captioned. The spelling and

	grammar are reasonable.
50	A poorly written report, which is hard to read because of insufficient logical flow. Figures and captions are poor or absent. There are multiple errors in spelling and/or grammar
40	The language and structure of this report are inadequate. The report is difficult to understand as there is no logical flow to the writing.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Plan

Scope and objectives

90	Detailed feedback will be provided
80	The plan conveys an outstanding appreciation of the nature and extent of the research problem to be addressed in the project, very clearly setting out the objectives and motivation.
70	The plan conveys a very good appreciation of the nature and extent of the research problem to be addressed in the project, setting out the objectives and motivation.
60	The plan conveys a satisfactory appreciation of the nature and extent of the research problem to be addressed in the project, showing awareness of its objectives.
50	The plan conveys an incomplete appreciation of the nature and extent of the research problem to be addressed in the project.
40	The plan conveys an inadequate appreciation of the research problem defined by the project.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Methodology and organisation

90	Detailed feedback will be provided
80	The division into work packages and the allocation of time and other resources to them provides an outstanding framework for conducting the project.
70	The work packages provide a very good framework for conducting the project. The allocation of time and other resources to them is very well thought-out.
60	The work packages provide a satisfactory framework for conducting the project. Some consideration has been given to the allocation of time and other resources.
50	The work packages provide an incomplete framework for conducting the project, with little consideration given to the allocation of time and other resources.
40	The work packages provide an inadequate framework for conducting the project, with insufficient consideration given to the allocation of time and other resources.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Presentation

Content and delivery

90	Detailed feedback will be provided
80	The presentation gave an outstanding overview of the project that set the work in context and very clearly explained the outcomes so far.
70	The presentation gave a very good overview of the project that gave a good sense of the context for the work and explained the outcomes so far.
60	The presentation gave a satisfactory overview of the project that gave some sense of the context for the work and of the outcomes so far.
50	The presentation gave an incomplete overview of the project, with little context or description of the

	outcomes so far.
40	The presentation gave an inadequate overview of the project, with little or no context or description of the outcomes so far.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Viva

Understanding and clarity of explanation

90	Detailed feedback will be provided
80	Your outstandingly clear answers and explanations demonstrated an outstanding level of understanding of the physics behind the project.
70	Your clear answers and explanations demonstrated a very good level of understanding of the physics behind the project.
60	Your answers and explanations were satisfactory and demonstrated a satisfactory level of understanding of the physics behind the project, apart from some misunderstandings.
50	You displayed an incomplete understanding of the physics behind the project. Some answers were incorrect and/or some explanations were unclear.
40	You displayed an inadequate understanding of the physical principles behind the project. The quality of answers and explanations was inadequate.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Report and diary

Effort and organisation

90	Detailed feedback will be provided
80	The project shows evidence of an outstanding level of industry and organisation, with time and effort well allocated and a very high volume of work produced.
70	The project shows evidence of a very good level of industry and organisation, with time and effort well allocated and a high volume of work produced.
60	The project shows evidence of a satisfactory level of industry and organisation. A reasonable allocation of time and effort has led to a satisfactory amount of work done.
50	The project shows evidence of insufficient industry and organisation. Time and effort have been poorly allocated.
40	The project shows evidence of an insufficient level of industry and organisation. Very little thought has been given to allocation of time and effort.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Initiative and independence

90	Detailed feedback will be provided
80	You have shown outstanding initiative and independence in conducting the project and demonstrated creativity by exploring novel directions.
70	You have demonstrated very good initiative and independence, at times probing new avenues.
60	You have demonstrated a satisfactory level of initiative and independence in conducting the project and overcoming difficulties.
50	You have demonstrated little initiative and independence in conducting the project.
40	You have demonstrated insufficient initiative and independence in conducting the project.
30	Detailed feedback will be provided
20	Detailed feedback will be provided

10	Detailed feedback will be provided
0	Detailed feedback will be provided

Quality of outputs and analysis

90	Detailed feedback will be provided
80	The work constitutes an outstandingly professional piece of research. The outputs and analysis are of outstandingly high quality, at a standard suitable for publication.
70	The work constitutes a competent and professional piece of research, and the outputs and analysis are of very good quality. They could be of a standard suitable for publication, subject to confirmation by research staff in the group.
60	Most aspects of the work meet the required professional standards. The research outputs and analysis are of satisfactory quality, and constitute useful results.
50	Aspects of the work fall short of the required professional standards. The research outputs and analysis are of poor quality, but perhaps constitute some useful results.
40	The work falls well short of the required professional standards. The research outputs and analysis are of inadequate quality.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Understanding shown of theory, method and techniques

90	Detailed feedback will be provided
80	Your writing displays an outstanding level of understanding of the theory, method and techniques relevant to the project.
70	Your writing displays a very good understanding of the theory, method and techniques relevant to the project.
60	Your writing displays a satisfactory level of understanding of the theory, method and techniques relevant to the project.
50	Your writing displays a poor understanding of the theory, method and techniques relevant to the project.
40	Your writing displays insufficient understanding of the theory, method and techniques relevant to the project.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Discussion and conclusions

90	Detailed feedback will be provided
80	The discussion is outstanding, making full use of the research outputs and relevant literature and leading to highly developed, insightful conclusions that are set within the context of the research area.
70	The discussion is very good, making use of the research outputs and relevant literature and leading to insightful conclusions.
60	The discussion is satisfactory, and some progress has been made in developing conclusions.
50	The discussion in the project report is poor, with only elementary progress towards relevant conclusions.
40	The discussion and conclusions in the project report are inadequate.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Language, figures and structure

90	Detailed feedback will be provided
80	An outstandingly well-written and well-structured report, which conveys its message efficiently and concisely. The figures are outstandingly clear and informative. The spelling, grammar and formatting are near perfect.
70	A very well-written report, which has very good structure and is easy to read. The figures are clear and informative. The spelling, grammar and formatting are very good.
60	The writing in this report is satisfactory, but with some errors in spelling and/or grammar. The logical

	structure is not always ideal, restricting the efficiency with which the message is conveyed. The figures are mostly clear and informative.
50	A poorly written report with frequent errors in spelling and/or grammar. It is poorly organised with little logical flow or clear structure. The use of figures is poor.
40	The writing in this report is inadequate. It is insufficiently well organised and has little logical structure. The figures are inadequate.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Comprehensiveness and contemporaneous use

90	Detailed feedback will be provided
80	The project diary provides an outstandingly comprehensive record of the progress of the research.
70	The comprehensiveness of the project diary is very good, providing a mostly complete and reliable record of the progress of the research.
60	The comprehensiveness of the project diary is satisfactory. Some elements are missing, but it mostly reflects the timeline of the work.
50	The comprehensiveness of the project diary is poor. It provides only a superficial record of the research, with significant elements missing.
40	The comprehensiveness of the project diary is inadequate. Little, if any, use has been made of the diary during the project work.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Clarity of note taking

90	Detailed feedback will be provided
80	Clarity of note taking is outstanding. The diary is easy for a third party to read and understand.
70	Clarity of note taking is very good. The diary can be understood by a third party.
60	Clarity of note taking is satisfactory. The diary can be understood by a third party with some effort.
50	Clarity of note taking is poor. The diary is very difficult for a third party to read and understand.
40	Clarity of note taking is inadequate. It is impossible for a third party to read and understand the diary.
30	Detailed feedback will be provided
20	Detailed feedback will be provided
10	Detailed feedback will be provided
0	Detailed feedback will be provided

Project Safety

This section must be read and not ignored. The guidelines are for your own safety. The documentation does seem a bit onerous sometimes for all concerned but it is essential that it becomes second nature (just like keeping your diary). As an incentive to keeping documentation we have two devices: Firstly, a checklist which is specific to your project and shows what is required. Secondly, there will be a **penalty of up to 5% off** the module mark for incomplete safety documentation. ALL students, INCLUDING THOSE DOING THEORY PROJECTS, must complete the risk assessment, even if these are trivial in nature, e.g.: "no significant risks are associated with this project".

The following is an extract from the general school safety directives and further, more detailed and specific, information which is regularly updated can be found at http://www.nottingham.ac.uk/~ppzphy/safety/Policy.htm. The sections on risk assessment and visual display working are particularly relevant.

In accordance with COSHH regulations and the Management of Health and Safety at Work regulations, all projects must be assessed to identify the hazards associated with

them and to determine the likelihood (risk) that the hazards will actually cause harm. Subject to the findings of the assessment it may prove necessary to modify the work activity in order to reduce the risk to an acceptable level. The assessment must be relevant to the specific situation (work activity) in which the hazard is encountered and must be in writing on a standard School form (which is attached to this handbook and available electronically on the safety website). There are a number of hazards to be found in a typical laboratory, these can include:

Hazardous substances covered by the COSHH regulations; High voltage electricity; Very high or very low temperatures; High pressures; Flammable substances; Vacuum (implosion hazard); Radiation (inc. UV and Lasers); RF and microwaves; High magnetic fields; Rotating and oscillating machinery.

You may not yet know all the procedures that might be needed in the course of your project. It is important to update your risk assessment for any new undertaking **before** it is carried out.

You will be given a 'Safety and Training Documentation Checklist' by the convenor responsible for your project at the beginning of the spring semester. This will indicate any further documentation required during the project. For example, all projects require an initial risk assessment, but some projects may require specific training for equipment etc. The checklist should be kept in a folder with copies of all relevant documents and should be available at all meetings and during laboratory working. For instance, if you do not have it with you when you are asked then you will not be allowed to work in the laboratory. Further copies of all your safety documentation may be required by laboratory staff or module convenors. When documents are added to the pack, the assessor or supervisor should sign the checklist. Subsequently, the convenor will add their signature when the documents are checked. As you are the ones likely to lose marks then you should make sure these documents are completed and signed – and make a reasonable fuss if they have not been done!

For those carrying out laboratory based work, either in the project or research labs, you will be given a 'Laboratory based working' form. Any specific training or instruction will be noted on the form. You should sign this form to say that you have received training on any equipment and that you have understood any local rules. The laboratory staff member will also sign this form if they are happy that all safety requirements have been completed. This form is fairly general and also serves to alert technical staff of project requirements. Additional project requirements can be added on further risk assessment forms and laboratory based working forms.

You should regularly review your safety documents and keep the paperwork up to date. If new procedures are devised later in your project, you must review the safety requirements before you start the new work. This checkpoint hopefully promotes such a habit.

A copy of basic school safety information is available in this handbook. In the event of you working in other buildings, departments or premises – please ensure that local area rules are followed and that basic information is noted before work starts.

Emergency Procedures (updated September 2022)

In the event of discovering a **FIRE** or **ACCIDENT** liable to cause injury to a person or damage to a building, follow the directions set out below:

FIRE

ACTIVATE THE FIRE ALARM

DIAL **8888** (INTERNAL) or **0115 951 8888** (EXTERNAL) AND STATE LOCATION OF THE FIRE

USE THE APPROPRIATE FIRE EXTINGUISHER IF NECESSARY TO CLEAR YOUR ESCAPE ROUTE

ON HEARING THE FIRE ALARM

EVACUATE YOUR PLACE OF WORK CLOSING ALL WINDOWS AND DOORS AS YOU LEAVE

LEAVE THE BUILDING BY THE NEAREST AVAILABLE EXIT AND GO TO ASSEMBLY POINT

WHERE APPROPRIATE FIRE MONITORS/PERSONNEL WILL COLLECT THE NEAREST FIRE TAG IF IT HAS NOT ALREADY BEEN COLLECTED, TAKE IT AND CHECK THAT THE ROOMS MARKED ON THE FRONT OF THE TAG HAVE BEEN EVACUATED.

FIRE ASSEMBLY POINTS

Physics Building Library steps	Near bottom of George Green
Sir Peter Mansfield Magnetic Resonance Imaging Centre	Visitors Car Park outside the building's reception area
Cripps Building	Physics Main Car Park

FIRE ALARM TESTS

Physics and Mathematics Building	1000 on Thursdays
Sir Peter Mansfield Magnetic Resonance Imaging Centre	0915 on Mondays
Cripps Building	0930 on Tuesdays

EVACUATION REFUGES

The University has provided the Physics and Mathematics building with four refuges. Each refuge is a designated temporary safe area where someone can wait in comparative safety for assistance. Each refuge has direct telephone communication with the University's Security Office and two refuges have evacuation chairs. The location of each refuge within the building is:

'A' Floor	Research Area	By Lift adjacent to MBE Unit Entrance
'B' Floor	Undergraduate Area	In Stairwell opposite Lecture Theatre B13
'C' Floor	Office Area	By Lift adjacent to Room C130

'C' Floor	Undergraduate Area	In Stairwell opposite Lecture Theatre C12	Evacuation Chair
'C' Floor	Research Area	By Stairwell adjacent to Room C114	Evacuation Chair
'C' Floor	Research Area	In Stairwell adjacent to Room C100	

ACCIDENT

In case of serious injury, dial **8888** (internal) or **0115 951 8888** (external) and ask for the Ambulance Service (the University does not have its own ambulance transport).
Obtain assistance from the nearest qualified first-aider.
When the Fire Brigade or Ambulance is needed state clearly where the service is required,
i.e. building name, laboratory/room number, and also give your name.
To prevent misunderstanding ask for the message to be read back.
For less serious injuries which require medical attention, the injured person should attend the Accident and Emergency Department at the Queens Medical Centre. Where only minor injuries have been sustained a first-aider should be able to provide treatment.
If no first aiders are available the Occupational Health Unit should be contacted for advice.

ACCIDENT REPORTING

All accidents causing injury, no matter how minor, dangerous occurrences (events capable of causing injury) and near-miss incidents must be reported as soon as practicable by completing the online form.
Safety Office http://www.nottingham.ac.uk/safety/ quick link to forms Report an Accident

IMPORTANT TELEPHONE NUMBERS

Cripps Health Centre:	75
Emergency Services (Fire & Ambulance):	8888 (internal) or 0115 951 8888 (external)
University Safety Office:	13401 (0900 to 1715)
Occupational Health Unit:	14328
Security:	13013

SAFETY WEB PAGES

University: www.nottingham.ac.uk/safety/
School: www.nottingham.ac.uk/physics/intranet/safety/Policy.htm
SPMIC: www.magres.nottingham.ac.uk

SAFETY PERSONNEL

School Safety Officer

Dr P.K. Milligan	Room C148	Ext 67729

FIRST AIDERS IN THE SCHOOL

ELLA	BATCHELOR	Physics Building/CAPT		Ella.Batchelor@nottingham.ac.uk
NICHOLAS	BOTTERILL	Physics Building	0115 95 15194	Nick.Botterill@nottingham.ac.uk
HENRY	BOWLER	SPMIC		HENRY.BOWLER@NOTTINGHAM.AC.UK
RICHARD	BOWTELL	SPMIC		Richard.Bowtell@nottingham.ac.uk
RICHARD	CAMPION	Physics Building		Richard.Campion@nottingham.ac.uk
PAMELA	DAVIES	Physics Building	0115 95 15374	pamela.davies@nottingham.ac.uk
OLGA	FERNHOLZ	Physics Building	0115 74 86720	Olga.Fernholz@nottingham.ac.uk
SUSAN	FRANCIS	SPMIC		Susan.Francis@nottingham.ac.uk
AGNIESZKA	GASIOROWSKA	Physics Building	0115 95 13082	A.Gasiorowska@nottingham.ac.uk
EMILY	JACKSON	Physics Building		Emily.Jackson1@nottingham.ac.uk
KASPER	JENSEN	Physics Building		Kasper.Jensen@nottingham.ac.uk
PETER	MILLIGAN	Physics Building	0115 84 67729	peter.milligan@nottingham.ac.uk
PHILIP	PARRY	CAPT	0115 84 68813	phil.parry@nottingham.ac.uk

ANDREW	PETERS	SPMIC	0115 84 68946	andrew.peters@nottingham.ac.uk
STUART	SALTER	SPMIC		Stuart.Salter@nottingham.ac.uk
DOMINIC	SIMS	Physics Building	115 846 8241	Dominic.Sims@nottingham.ac.uk
MATTHEW	YOUNG	Physics Building	0115 74 87257	Matthew.Young2@nottingham.ac.uk

LOCATION OF FIRST AID BOXES

Physics & Mathematics Building

Foyer	Main Foyer Reception	Reception in Cupboard
Room A124	Research Laboratories	Outside door
Room A14	Third Year Laboratory	On wall near writing board
Room A22	Second Year Laboratory	On wall near writing board
Room B140	Cold Atom Laboratories	On wall
Room B16	MSci Coffee Room	Behind door
Room B219	Electronics Workshop	Behind door
Room B500	Liquefier	Plant room
Room C14	UCAS Office	Behind counter

Magnetic Resonance Centre

Reception Area	On Wall outside Room 10
Bottom Corridor	On wall outside Records Store
Bottom Corridor	On wall opposite Room 3
Top Corridor	On wall opposite Room 16
Top Corridor	On wall opposite Room 23
Biochemistry Laboratory	On table opposite fume cupboard
New Building Room 28	On wall outside Room 29
New Building Room 36	On wall outside Room 37

Cripps Building

Room A112a	Secretaries' Office	Near filing cabinet
Kitchen	Kitchen	On wall

Choice of Project

On Moodle, you will find a document containing a list of titles of the available projects and the names of the supervisors. In each case you will find a brief outline of the nature of the project, the basic physics involved and a guide to what you will be doing on a day-to-day basis. Also given are the supervisor contact details.

You are requested to state preferences for these projects using the form on Moodle. Your completed form should be submitted by

5:00pm Wednesday 5th October

You must list 10 projects you would be prepared to do and place them in order, your first choice at the top of the list and tenth at the bottom.

Important: You may not do a project that continues work you have done either in a 3rd year project or in a summer vacation project. You can only be assessed on work you have done during the academic year. This rule is applied to ensure the system is fair to all students and none gain an unfair advantage.

If you wish, you can make comments as to why you want to do a particular project. Note that all replies are confidential. Where possible we will try to allocate projects in line with your top three preferences but this is not always possible.

Although project groups will be allocated by the module convenors, it would be helpful if students could indicate if there are any students with whom they *would* or *would not* wish to work. This information will be treated as strictly confidential and it is not necessary to give reasons.

Please check your form carefully before submitting it: Incorrect or incomplete project preference forms will be returned to you for correction and in the meantime project allocations will take place, therefore you may miss out on your preferred choices.

There will be a project allocation and introduction meeting at:

Monday 17th October