

Physics 3 Lab Guide 2006-2007

This guide gives the detailed arrangements for experimental work. *It should be kept for future reference.* If any points are unclear, ask the Lab Head, Prof Miles Padgett.

Safety in the Laboratory

Safety is the overriding consideration when carrying out practical work and the department operates a ["Code of safe practice for Undergraduate Students"](#). All students are given a copy of the code at registration and are required to sign a declaration that they have read it and will abide by its provisions at all times. The laboratory contains experiments that use high voltages, radioactive sources and lasers. While all experiments are safe in normal working, misuse could create a safety hazard. **IF IN DOUBT, ASK.**

ON EACH DAY THEY ARE PRESENT, ALL STUDENTS MUST SIGN IN AND SIGN OUT OF THE LABORATORY ON THE LIST PROVIDED

Learning Objectives for P3 Laboratory

| |
|---|
| Induction(222) |
| <ul style="list-style-type: none">• to understand the structure of the laboratory• to learn what is expected from the laboratory• to understand the ILO's and assessment criteria• to appreciate potential difficulties |
| Experiment (4th fl lab) |
| <ul style="list-style-type: none">• to practice and improve oral presentational skills• to learn how to keep a clear and concise lab record• to develop analytical skills regarding experimental results• to expand understanding of underpinning physics• to perform experiments to a high standard• to reach sensible conclusions from experimental evidence |
| Report on Exp |
| <ul style="list-style-type: none">• to develop written skills in structuring reports• to present experimental method in written form• to present experimental results and errors in written form• to logical interpret results and present in written form• to present summary and conclusions |
| Skills revolution |
| <ul style="list-style-type: none">• to apply logical analysis to problem solving• to learn the key to successful teamwork• to gain exposure to business type problems• to interact informatively with industrialists |
| IT |
| <ul style="list-style-type: none">• to learn to program in a standard language• to use computers to solve physical problems• to learn to program in a high level language |
| Group proj. (4th fl lab) |
| <ul style="list-style-type: none">• to apply skill and knowledge to complete allocated tasks• to learn how to contribute to team success• to individually present orally project work completed• to present contribution to group project in written form• to make a group written presentation• to contribute to and deliver a group oral presentation |

Administration

Laboratory Staff

| | | |
|----------|--------------------|--|
| Lab Head | Prof Miles Padgett | m.padgett@physics.gla.ac.uk |
| Lab Tech | Mathew Trainer | m.trainer@physics.gla.ac.uk |

Registration

At Class Enrolment all students must complete a lab registration form before they can start any practical work in Physics 3. **If any of the information on your registration form changes (eg. your address), you must inform the Lab Technician straight away.**

Lab Sections

The students within the laboratory are divided into 2 sections: S1 and C1.

S1 includes single Honours Physics BSc and MSci students, students doing a BSc designated degree (120 credits) and some exchange students

C1 includes students doing BSc designated degrees (60 or 80 credits) and includes students doing Chemical Physics, and combined Honours Physics and Electronic Engineering students are allocated to section.

Special arrangements are made for Combined Honours BSc Physics and Computing Science students. Due to timetable reasons these students can only attend on Tuesdays.

If you have any doubt into which section you fall ask!

Notices

Instructions and notices about labwork will be placed on the notice boards in the corridor outside the lab office, R423a. Please check this board at least once a week.

Exchange Students

Exchange Students wishing to do laboratory work should see the Lab Head individually to discuss their requirements.

Repeated Years

Students repeating the Class must discuss the position with regard to previous laboratory work with the Lab Head. The Lab Head, in consultation with the Class Head will decide on the requirement for the current year.

Timekeeping and deadlines....

Attendance and absences

Laboratory attendance is a course requirement and students are required to complete a "Certificate of Absence" form (available from the Lab Technician) to explain **all** absences. Attendance is recorded by sign-in sheets, available in each room for the first hour each lab day. On leaving the laboratory all students must sign out – these requirements being a safety issue.

Students absent from the laboratory for short periods are expected to make up for the time missed by attending on additional days as agreed with the lab technician. Students with longer absences, or absences immediately prior to any of the deadlines for the submission of work, should discuss their individual situations with the Lab Head.

Deadlines for handing in work are indicated on the timetable. Work handed in late will be subject to a 10% per day penalty. In exceptional circumstances a deadline extension may be granted by the labhead. BUT THIS MUST BE AGREED IN WRITING ONE WEEK PRIOR TO THE DEADLINE.

Laboratory Days and Times

The Laboratory is open for practical work from 11.00 - 17.00 on Tuesdays and Thursdays. **No experiment should take more than four Lab days** to complete, write up and have marked. If you fall behind this rate you will fail to complete the work required – please see the labhead to discuss the problem.

The total learning hours allocated to laboratory work are significantly larger than the number of hours spent "at the bench". Students are expected to carry out additional work outside the laboratory in order to complete the analysis of their experiments, to prepare talks and to write reports. Students who do not put in the necessary effort are likely to fall behind with their lab work and not complete the set number of experiments by the end of the year.

Single Honours Students should not have any other classes scheduled during official laboratory periods. However, it has been known for other departments to schedule lectures during physics lab times and this can interfere with labwork for Combined Honours students. In the case of unavoidable timetable clashes students are expected to make up for time missed by attending the laboratory at additional times at a convenient point in their timetable. Note that no demonstrators will be on duty outside the official hours.

Availability of Demonstrators

Demonstrators are only on duty during official laboratory hours. Demonstrators will try to arrange cover to match demand, with several demonstrators present in each room at times of peak demand and fewer around at quiet times, *e.g.* lunchtime. If there are only one or two students in a room, demonstrators may leave a telephone contact number and go off to their office to do other work.

Remember demonstrators are there to help you. If you have a problem don't wait for a demonstrator to ask you how you are getting on - go straight to a demonstrator and ask for help. Again, if a demonstrator is *on call* at quiet times, do not hesitate to phone up if you need assistance.

Timetable, requirements and allocation

| Timetable for P3 laboratory S1, C1 | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------|-----|--------|-----|-------------------------|-----|---------------|-----|--------|-----|---------|-----|---------------|-----|---------|-----|-------------------|-----|---------|-----|--------------------------|------|---------|-----|--|
| Key | Induction | | | | Experiment (4th fl lab) | | | | IT | | | | Report on Exp | | | | Skills revolution | | | | Group proj. (4th fl lab) | | | | |
| | Week 1 | | Week 2 | | Week 3 | | Week 4 | | Week 5 | | Week 6 | | Week 7 | | Week 8 | | Week 9 | | Week 10 | | Week 11 | | Week 12 | | |
| Day | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | |
| Date | 26Se | | 30c | | | | | | | | 31Oc | | | | | | | | | | 5De | | 14De | | |
| S1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| activity | Ind. | | Exp 1 | | | | Exp 2 | | | | Exp 3 | | | | Exp 4 | | | | IT | | | | | | |
| Deadline | | | | | | | | | | | | | | | Rep Exp | | | | IT | | | | | | |
| C1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| activity | Ind. | | Exp 1 | | | | Exp 2 | | | | Exp 3 | | | | IT | | | | | | | | | | |
| Deadline | | | | | | | | | | | Rep Exp | | | | IT | | | | | | | | | | |
| Induction is at 2.00 in 222 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Week | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | | 21 | | 22 | | | | | | |
| Day | Tue | Thu | Tue | Wed | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | Tue | Thu | | |
| Date | 9Ja | | 16Ja | | | | | 1Fe | | | | | | | | 1Ma | | | | | | 15Ma | | | |
| S1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| activity | | | Skills | | | | Group Project | | | | | | | | | | | | | | | | | | |
| Deadline | | | | | | | | | | | | | | | | | | | | | | | GP | | |
| Note additional Wednesday of week 14! | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| activity | | | Skills | | | | | | | | | | | | | | | | | | | | | | |
| Deadline | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Deadlines apply at 17.00 on the day indicated, after which marks will be deducted at 10% per day Work submitted after end of week 22 will receive no mark All lab recrds and reports should be handed in for moderation at end of week 22</p> | | | | | | | | | | | | | | | | | | | | | | | | | |

| Requirments for completion of the P3 lab | | | | | | |
|--|--------|--------|-----------|--------|--------|-----------|
| | S1 | | | C1 | | |
| | number | credit | total | number | credit | total |
| Induction | | | | | | |
| Experiment (lab) | 4 | 4 | 16 | 3 | 4 | 12 |
| Report on Exp. | 1 | 3 | 3 | 1 | 3 | 3 |
| IT | 1 | 4 | 4 | 1 | 4 | 4 |
| Skills revolution | 1 | 1 | 1 | 1 | 1 | 1 |
| Group proj. (lab) | 1 | 16 | 16 | | | |
| TOTAL | | | 40 | | | 20 |
| Group proj. (lab) marked on the 20pt scale | | | | | | |

Allocation of Experiments

The division of students to sections and the initial allocation of students to particular experiments will be displayed in the corridor of the Physics 3 Laboratory on level 4. You will find the script for the first experiment on the allocated bench.

After the record has been assessed, you will be assigned a further experiment and should collect the new script from the racks in the Laboratory Office (R423a). You should spread your experimental work over as wide a range of topics as possible.

Sometimes, an appropriate demonstrator will not be available to mark your record straight away. To avoid having to wait around, you can ask any free demonstrator to allocate you another experiment. However, this is a concession. You should ensure that the outstanding experiment is marked **within 2 lab days** so that you get the necessary feedback. You will not be allocated a further experiment if you come to the end of your current experiment and there is still a previous one unmarked.

Equipment

Equipment provided by the student

You will require an A4 notebook for your laboratory record book. **This is essential.** Lab reports will be word-processed (see below) so a separate report book is not required.

Data-Acquisition, Data-Analysis and Report Writing

PCs are integral to many of the experiments in the laboratory. These PCs are also used for analysing data and preparing the results. In addition there are 2 general purpose PCs in the Materials Room and 3 in the RF Room that are available for use by students wishing to analyse data from other experiments. EXCEL and WORD are available on all PCs in the laboratory for data analysis and report writing.

In general, the software loaded from a server into the PC. Many of the PCs are set up so that they are *cleaned* i.e. all files on the local hard disc are removed and only the ones that are supposed to be there are re-written from the server. This means that your data or document files on the *local* hard disc will disappear when you log out or if the computer is restarted. Note that the amount of space available to you as part of your University account is strictly limited and it is up to you to manage it.

Sometimes the system crashes requiring you to re-start the PC. If you just press the re-start button, you may go straight into the *cleaning* procedure and hence lose any files on the local hard disk that have not been saved elsewhere. There are a number of ways of preventing this happening and if you think you are in this situation ask for help from a demonstrator or technician.

There are many PCs throughout the Department and the University. However, there can be a high demand for word processors when reports fall due. Thus, don't leave it until the last minute. (This is sound advice from many points of view especially because of the need to read the first draft carefully and revise it.)

KEEP BACK-UPS OF ALL YOUR FILES. In addition, when writing reports, save your last version with a different file name before doing further work on it. If anything goes wrong you will then still have your original text and diagrams.

Plagiarism

Plagiarism is defined as the submission or presentation of work, in any form, which is not one's own, without acknowledgement of the sources. The University's degrees and other academic awards are given in recognition of the candidate's personal achievement. All suspected cases of plagiarism will be handled in accordance with the University Plagiarism Statement, which can be found at <http://senate.gla.ac.uk/academic/plagiarism.html>.

In the context of the Physics 3 Laboratory, the above policy is not intended to stop you discussing your laboratory work with other students - in fact we encourage this. You must not, however, directly copy anyone else's experimental results (except for students working in group projects), records or reports.

Assessment

Assessment of Experiments

On completion of an experiment, ask a demonstrator from that room to mark it. Normally, a demonstrator will be free to do so within a short time. The assessment process will give you immediate feedback about your performance. All experiments are marked within normal Laboratory Hours (Tuesdays and Thursdays 11.00 – 17.00). Marking of experiments is based on a 10-15 min interview between the student and a demonstrator centred around the marking sheet below. Students should note the marking criteria to which they are assessed since this will help them in the preparation. Note that all interviews will commence with **the student giving an informal, 3-5min oral account** of the experiment, incorporating a description of the basic experiment, its objective and the main result. During the marking process the student and demonstrator will refer to the laboratory record (**see lab induction for tips on maintaining lab records**) of the student, which should hence be completed prior to marking! There are more students than demonstrators, as marking can become busy, it is best to make prior arrangements as to when and where your experiment will be marked and by whom.

| Physics 3 Experiment Mark Sheet | | |
|---|--------------------------|--|
| Student: | <input type="text"/> | |
| Experiment: | <input type="text"/> | |
| Marker: | <input type="text"/> | |
| Date Marked: | <input type="text"/> | |
| Tick here if submitted after deadline | <input type="checkbox"/> | |
| Tick here if cross-check or reassessment | <input type="checkbox"/> | |
| For each section in the table give a mark from 0 to 5, to nearest half-integer (% equivalent marks) If required, write comments on the student's performance on the back of the sheet. | | |
| Oral presentation: Did the student speak clearly and concisely? Were they able to explain the basis of the experiment? Did they convey the main results? Did they draw any natural conclusions? | 5 | |
| Record Keeping: Has the student kept a proper record of the practical work? Is it clear how the measurements were taken? Are the readings written down into the notebook? Are there suitable headings and units? | 5 | |
| Analysis: Have the measurements been analysed? Is it clear how the calculations were performed and where the data is from? Are the graphs and tables labeled? Is there an error calculation? | 5 | |
| Understanding: Does the student understand the principles of the experiment and the use of the apparatus at the level required in the experiment? Does the student understand the underlying physics? | 5 | |
| Standard: Was the work involved in the experiment carried out to the appropriate standard taking into account any equipment malfunctions experienced?. Were the results in the accepted range? | 5 | |
| Conclusion: Is there a conclusions section? Are these supported by the results? Is a comparison made with accepted values? Is there a discussion of sources of error (systematic and random) and their effect on the result? | 5 | |
| Final Mark | 30 | |

Assessment of Reports

All reports are marked by the demonstrators within normal laboratory hours but in the absence of the student. Students should note the marking criteria to which they are assessed since this will help them in the preparation (see lab induction for tips on writing a lab report).

| Physics 3 Report Mark Sheet | | |
|---|--------------------------|--|
| Student: | <input type="text"/> | |
| Experiment: | <input type="text"/> | |
| Marker: | <input type="text"/> | |
| Date Marked: | <input type="text"/> | |
| Tick here if submitted after deadline | <input type="checkbox"/> | |
| For each section in the table give a mark, to the nearest half-integer (% equivalent marks) If required, write comments on the student's performance on the back of the sheet. | | |
| Presentation, Grammar, Style and Structure: Is the report neatly word processed with clear labeled diagrams and appropriate figure captions? Is the English correct? Is the report structured and are all the parts tied into the whole? Is there an appropriate abstract? | 9 | |
| Abstract, Introduction, Theory, Apparatus and Method: Is there an abstract, does the introduction explaining what is being done and why? Are the relevant theoretical results quoted? Are the principles and key features of the apparatus described with suitable diagrams. Are the important features of the measurements described and irrelevant detail left out? | 6 | |
| Results, Errors and Interpretation: Are the results presented clearly with suitable graphs. Is the principle of calculations presented? Is there a discussion of the meaning, significance and interpretation of the results? Has a attempt been made to compare the results with accepted values? Have the possible sources of errors been considered? <i>(This is not a re-marking of the equipment)</i> | 9 | |
| Summary and Conclusions: Are the results of the experiment summarised? Are sensible conclusions drawn? Are the conclusions supported by the results obtained? Has the student commented on whether the objectives have been achieved? Is there a reasonable attempt to pull all the parts together? | 6 | |
| Final Mark | 30 | |

Assessment of IT labs

All IT work is assessed with the IT module by the demonstrators involved. Some of the work is assessed and marked against declared milestones.

Assessment of Skills Revolution

Dr. Courtial is coordinating the Skills Revolution and will provide details towards the end of Term I. The Skills Revolution forms an integral part of the Physics 3 class and participation is a course requirement for all students. Students taking part will be awarded 1 credit

Assessment of Group Projects

Groups projects are assessed by various demonstrators. Allocated task, Oral Presentation and Management will be assessed primarily by the demonstrators running the project. The reports and group presentation will be assessed by other demonstrators. Students should note the marking criteria to which they are assessed since this will help them in the preparation

| Physics 3 Group Project Mark Sheet | | |
|--|---|----------------------|
| Student: | <input type="text"/> | |
| Project: | <input type="text"/> | |
| Project supervisors: | <input type="text"/> | |
| Date Marked | <input type="text"/> | |
| Marker (for report): | <input type="text"/> | |
| Date Marked: | <input type="text"/> | |
| Tick here if submitted after deadline | <input type="checkbox"/> | |
| Tick here if cross-check or reassessment | <input type="checkbox"/> | |
| <p>For each section give a LETTER score relating to the 22pt scale (NB not a %!) Scores equate to A(1,2,3,4,5) =1stClass, B(1,2,3) = 2i, C(1,2,3) =2ii, D(1,2,3) =3rd, E-etc = fail If required, write comments on the student's performance on the back of the sheet.</p> | | |
| Allocated tasks: Did the student complete the task which they were set? Did they "pull their weight" in the team? Were they able to interact within a team environment? | A-G, N, CR (1,2,3,4,5) weight 30% | <input type="text"/> |
| Oral presentation: Did the student speak clearly and concisely? Were they able to explain the basis of their task and relation to the project? Did they convey the main results? | A-G, N, CR weight 10% | <input type="text"/> |
| Project management: (awarded to the group) Did the group work well as a team? Did they structure the management and communicate with each other? Did they take team decisions? | A-G, N, CR weight 10% | <input type="text"/> |
| Individual Report: Did the report cover the allocated task? Does it place these in context of the project? Were results and errors dealt with appropriately? Does the student understand the underlying physics? | A-G, N, CR (1,2,3,4,5) weight 20% | <input type="text"/> |
| Group report (awarded to the group) Did they all contribute to the preparation of the report? Does it summarise the individual tasks? Are the tasks placed in context of the whole project? | A-G, N, CR weight 15% | <input type="text"/> |
| Group presentation: (awarded to the group) Did all contribute to the preparation? Were the tasks placed in context of the whole project? Were conclusion drawn? Was the use of visual aids appropriate? | A-G, N, CR weight 15% | <input type="text"/> |
| Final Mark (22pt. scale) (Summed mark x weighting factor, rounded up to nearest integer) | 22 | <input type="text"/> |

Appeals

If you think your work has been incorrectly assessed, you should ask the demonstrator to explain why you have been given a particular mark. If you are still not satisfied you can appeal directly to the labhead. The labhead will listen to the arguments from both the student and the original marker before deciding the final mark. The labhead may seek opinions from other markers, or ask a different marker to reassess the work. Any appeal must be made immediately following the assessment. If the labhead is not immediately available, you must submit your labbook to the lab technician, who will keep it until the labhead is available. This is to ensure that the work is not changed or added to before the appeal is considered.

Progress and Lab Completion

Students should monitor the rate at which they are working regarding the requirements of their section. It is possible to complete the laboratory requirement in less than the allotted time and you should do so if possible. This will allow you more time for revision of course work.

If you fall behind with your work due to a short absence you should make up for the time lost by coming into the lab outside the official lab hours. In the case of longer absences you should discuss your circumstances with the Lab Head.

If you are attending the lab regularly but are still falling behind with your work you should discuss the reasons with the demonstrators and/or the Lab Head. You may need to come into the lab at additional times to complete your work. In some cases, it may be better to submit a partly completed experiment for assessment, have it assessed for a suitable fraction of the total marks, and move on to a fresh experiment.

It is extremely important that if you find yourself struggling with laboratory work that you discuss your problems with the Lab Head as soon as possible. The earlier that your circumstances are discussed the more options are available for sorting out any problems.

Students who fail to attend regularly or who fail to carry out the required labwork will be deemed **not to have completed the course** and a recommendation for the award of an **N-grade** will be forwarded to the examining committee. In the absence of exceptional extenuating circumstances, the **minimum** attendance requirement is that students must have attended for the full lab hours on at least half of the lab days appropriate to their lab section. They must also have submitted appropriate certificates to cover **all** of their absences from the laboratory. The **minimum** work requirement will normally be the completion of at least half of the work set out for the appropriate section of the class. To complete the work properly, it must have been carried out mainly during Official Laboratory Hours and it must be of an acceptable standard (work scoring over 45% on average will be judged acceptable). The requirements for completion and submission of work by the various stated times apply.

Submission of Work for Moderation and Examiners Meetings

The moderated marks and lab books will be presented to the external examiner at the Physics 3 Examiners Meeting. The work will be retained until six months after a student finally graduates. This is to allow the material to be considered in any appeal processes following decisions about the award of degrees. *i.e.* students wishing to reclaim their work should arrange to collect it from the lab technician in the January after graduation. Work not collected within 12 months after graduation will be disposed of.