



The  
University  
Of  
Sheffield.

Department  
Of  
Physics &  
Astronomy.

# Physics Third and Fourth Year Information 2017-2018

This section is intended to provide a summary of important course information for third and fourth-year students taking single or dual honours BSc or MPhys degrees involving Physics and/or Astronomy. It should be read in conjunction with the Department's "Degree Programmes and Module Descriptions" on the departmental webpage, which provides detailed information on the courses offered.

## 1. Year Tutors

**3rd Year Physics and BSc Course Tutor:** Dr Chris Booth

**3rd and 4th Year Astronomy Tutor:** Prof Clive Tadhunter

**4th Year Tutor and MPhys Tutor for Physics:** Prof Mark Fox

Dr Booth, Prof Tadhunter and Prof Fox will be happy to advise you if you have any questions or problems regarding your degree course. Course information will be available on the year web sites. Follow links from: <http://www.shef.ac.uk/physics/teaching> to reach these sites.

Information will also be posted on the Astronomy noticeboard outside the astronomy lab (E36), the 3rd year noticeboard next to room E32 and the MPhys noticeboard opposite room E28. Students may also be sent information by e-mail. All students are expected to check the relevant websites, notice boards and e-mail on a regular basis.

## 2. Teaching and Learning in Physics

### Introduction

Most physics lecture courses follow the same pattern as in years 1 and 2, although some courses, especially in the 4th year, will involve independent or student-led learning. Further details are given in the relevant module descriptions. One major difference in the 3rd and 4th years is that there are no tutorials. However, students are strongly encouraged to discuss any academic problems with the relevant course lecturers, or with their personal tutor. Tutors will also do their best to help with any other problems, and to provide guidance on module choice, postgraduate studies etc. In addition you may contact your tutor from Year 2 who is also available to provide support and guidance.

### Third Year Progression

For students on the BSc, there are three requirements that must be satisfied in order to graduate with an honours degree, in addition to obtaining an adequate average grade. Firstly, you must obtain at least 200 credits from Years 2 and 3 combined – in other words, you must not fail more than a total of 40 credits in these two years. Secondly, the University requires that you pass at least 90 credits at level F6 or above – that is modules with codes PHY3nn or PHY4nn (or equivalent modules from other departments such as Mathematics). Thirdly, you must pass your Third Year project (PHY341, 342, 346, 391, 392, 393 or 394). Note that there are no resit examinations in the summer for Third Year courses.

For students on the MPhys, it is necessary that at least 100 Third Year credits are obtained, with a year average of at least 59.5, in order to progress to Year 4. This is due to a more challenging 4th year and the fact that the pass mark is 50% for level 4 modules.

## Projects

A key major development in years 3 and 4 is the introduction of **project work**. In the 3rd year, all Physics students (single and dual honours, BSc and MPhys) undertake some form of project work. All students have the opportunity to do a 10 credit physics research project - either PHY341 in Semester 1 or PHY342 in semester 2. Many students also have the option of replacing this with a 20 credit Industrial Project (PHY346), Quantum Information Laboratory (PHY391), Physical Computing (PHY392), Microscopy and Spectroscopy Laboratory (PHY393) or Physics Education and Outreach (PHY394) which run throughout the academic year. The exact regulations depend on the degree course being followed - the constraints depend on whether other project work is required and how much core material there is in the programme. Physics, Theoretical Physics, Physics and Astrophysics and Physics with Computer Science students can take either a Physics Project or one of the 20 credit extended projects. BSc Physics and Philosophy students have the same choice. However, Physics with Medical Physics students, who are also doing a 20 credit medical physics project, can only do a 10 credit Physics Project, and the same is true for MPhys Physics with Philosophy students, who do not have room in the third year timetable for a 20 credit project module. All Astrophysics students also take an Astronomy Project.

Third and fourth year students are eligible for **The Graph Prize** for effective graphical presentation of data. Up to three prizes will be awarded to each cohort annually. For more details, see <http://tinyurl.com/TheGraphPrize>.

In the 4th year, all MPhys students undertake a major research project that runs across both semesters. Students choose from a list of projects offered by the Department, with the exception of Medical Physics students, who take project MPY401 organized by the medical physics department.

A summary of all the project modules is given below. More detailed information will be issued by the relevant module leaders at the appropriate time. As a result of a few instances of plagiarism in written work, you will be required to submit an electronic copy of your report to the Turnitin plagiarism detection software, in addition to providing printed copies of the report. Further details are included in the main section of the Undergraduate Guide, and will be provided in the Third and Fourth Year meetings at the start of the semester.

### **Third Year Research Project: PHY341/342 (Module Leader Dr Chris Booth)**

In this module, students build on the experience they have obtained in the first and second year labs to pursue more independent lines of investigation, under the guidance of an academic supervisor. The project is normally carried out with a partner. A list of topics offered will be handed out during the meeting held at the start of the semester to introduce project work, and the choice of topic should be decided upon as soon as possible. To aid students in their choice a poster display containing brief details of each project will be arranged in the Third Year Study Room (E42) during the first week of the semester. Information will also be available on the web. Choices must be made by the Thursday of that week and a list of allocated projects will be available by the beginning of the following week. It is the responsibility of each student to choose a partner and to decide on their choice of project (with a priority order) as soon as possible. To help with this, supervisors of each project will be prepared to discuss individual projects with interested students during week 1. *You are strongly advised to use this opportunity to ensure you understand what your selected projects entail.*

The normal expectation is that for this 10-credit project you should devote the equivalent of two to three afternoons (about 7 hours) per week. Students should make sure that effort on the project is distributed as evenly as possible throughout the semester. Concentrating most of your project work into the last few weeks can have disastrous consequences, not only for the project but also for your other courses. Supervisors will be happy to provide advice on project time planning. Normally students will work in pairs on each research project but, on completion, will be examined separately.

Assessment of PHY341/342 is split between the **project attempt** (25%), the **written report** (50%) and an **oral examination** (25%).

1. **Project Attempt:** this part of the assessment is based on how well you went about the actual execution of the project work. Part of the assessment will be based on the individual record kept in your laboratory notebook, which must be handed in with your project work. The following criteria (equally weighted) are used in the assessment: *Understanding, Scientific Practice, Effort, Initiative and Self-motivation, and Overall Achievement*.

2. **Written Report:** On completion of the project independent written reports must be submitted by each partner by the deadline indicated on the enclosed 3rd year planner (Section 6). Late submissions will have marks for the report docked by 5% per working day, unless an extension is agreed by Dr Booth. Extensions, which will only be granted in exceptional circumstances (normally for documented medical or similar reasons), must be agreed *in advance* of the project deadline. The report is read and assessed for both content and presentation by the project supervisor and a second marker. Guidelines and instructions for report preparation will be issued at the beginning of each project.

3. **Oral Examination:** After they have read your report, the supervisor and 2nd marker will conduct an oral examination, where you will be asked to give a short (5 minute) **informal** overview of your work. After this, the assessors will ask questions based on the content of your report, and may ask you to clarify any ambiguities and justify any omissions. You may also be asked questions on the background physics appropriate to your project topic. Questions should normally be straightforward to answer if you carried out the work thoroughly and thoughtfully. The oral exam should last for about 30 minutes. The timetables for oral exams will be posted on the year noticeboards. **It is your responsibility to confirm venues and times with project supervisors.**

## **Industrial Project: PHY346 (Module Leader Dr Alastair Buckley)**

PHY346 provides students with an industrial project where team working, planning, time management; presentation and report writing are integrated with science problem solving. The industrial client poses a problem that a group work on over two semesters to resolve. Interim and final presentations are made to the client and academic supervisors. Project work may use laboratory measurement and computational approaches as well as referencing leading research literature.

Assessment will consist of the following:

1 An interim presentation (25%) at the end of the first semester given by the team and assessed by academics with advice from industrial panel if appropriate. Credit will be given only to students who contributed to, and attended, the presentation.

2 A final Presentation (25%), assessed by all academics in consultation with industry representatives. Credit will be given only to students who contribute to the presentation.

3 An individually written Report (25%), marked by two academics. Credit will be given only to students who have submitted an electronic copy to Turnitin, and only if the report was cleared by Turnitin.

4 Individual contribution to group effort (25%). Individual contribution will be assessed by one academic on the evidence of an individual project workbook, attendance, and self reflection reports at the end of each semester. Credit will be given only to students who have submitted a project workbook, and self reflections..

## **PHY391 Quantum Information Laboratory, PHY392 Physical Computing, PHY393 Microscopy and Spectroscopy Laboratory or PHY394 Physics Education and Outreach**

For information on these please see the department's module web pages.

## **Fourth Year MPhys Research Project: PHY480 (Module Leader Prof. Mark Fox)**

Please note that all fourth years taking PHY480 should go to the year 4 web site (<http://www.sheffield.ac.uk/physics/teaching/fourth-year>) as their main source of information.

This project is core for all 4th year MPhys students in the Department except students in the following category:

- those taking an MPhys in physics with medical physics. These students take the project MPY401 organized by the medical physics department in place of PHY480.

Handbooks to guide students through the autumn and spring semesters of the project can be obtained by following the links on the right hand side of the 4th year www page: <https://www.sheffield.ac.uk/physics/teaching/fourth-year>. This web site also provides a link to a table of upcoming dates and deadlines. This is where you find out about dates associated with the project, such as the dates for submitting your reports in semester 1 and semester 2. All students are expected to check this web site regularly and familiarize themselves with dates and deadlines from this source.

## **Problem Solving and Advanced Skills (PHY340/PHY350)**

In addition to the lectured units and projects, students take a third year course in the solving of short problems. Most students take PHY340 "Problem Solving and Advanced Skills in Physics", while Dual Physics/Astrophysics students take PHY350 "Problem Solving and Advanced Skills in Physics and Astrophysics". These modules span both semesters. Lectures and tutorials will build on previous skills developed involving data analysis and errors, information retrieval and scientific writing. This involves group work, and is assessed by means of a data challenge in the second semester and peer-assessed group activities. There will also be regular group problems classes devoted to developing "problem solving" skills, and your abilities will be assessed by an examination at the end of the second semester.

## **Theoretical Physics in Year 3 and 4**

The BSc in Theoretical Physics differs from the BSc in Physics in that the following courses are core for theorists and optional for BSc physicists; Further Quantum Mechanics PHY349, Statistical Physics PHY339, Mathematical Physics PHY313. However, PHY382, Semiconductor Physics and Technology, is optional for theorists. This leaves 20 credits of optional modules from mathematics or physics (or 10 credits if an extended project module has been chosen).

Year 3 of the MPhys in Theoretical Physics differs from the MPhys in Physics in that there is a compulsory course in Mathematical Physics, PHY313, but PHY382, Semiconductor Physics and Technology, is optional. There are two optional modules of 10 credits which can be either maths or physics modules, chosen from a list (or one if an extended project module has been chosen).

In Year 4, theorists take PHY480, Research Project in Physics and Astronomy, usually choosing a theoretical project. PHY472, Advanced Quantum Mechanics, is also compulsory. There are then 70 credits worth of options chosen from 4th year.

## **3. Teaching and Learning in Astronomy**

### **Lectures**

Most lecture courses follow the same pattern as your first and second year courses. More details can be found in the module descriptions. As in previous years, attendance at lectures will be monitored

and you will be asked to account for persistent absences.

### **Third Year Group activity and Problem Solving**

Third Year astronomy problems classes are run by the Year Tutor, Prof Tadhunter. In addition to regular course units there will be a short examination devoted to the solving of short problems in physics and in astrophysics. This is taken in Semester 2 by all Physics & Astrophysics dual honours students (PHY350). In Semester 1 there is a group activity, overseen by Dr Cartwright involving a problem that will likely require a computational solution, with an associated literature search. Skills sessions are intended to help your preparation for later project work.

### **Third Year Projects**

All Dual Honours Astrophysics students are required to complete one 10-credit astronomy project in the third year (PHY319). This is co-ordinated by Prof Tadhunter. You should expect to do around 70–80 hours of work (two afternoons a week over 10 weeks) for the project. It is important to start on your project as early as possible: you do not want to leave yourself with most of the work still to do at the end of the semester when you should be revising for your exams! You should organise regular meetings with your supervisor to ensure that any problems are addressed promptly and to give yourself a framework around which to plan your work. Project work is normally carried out in pairs, or occasionally small groups, but each person is assessed separately. In PHY319 the assessment is by project attempt (25%), written report (50%) and oral exam (25%) as in the equivalent physics project PHY341/342 outlined above. As with essays, both the written report and oral viva will be graded by two members of staff.

A number of students will be permitted to conduct their third year project, PHY319, during a one-week field trip to the Observatorio del Roque de los Muchachos on La Palma, where students use the Sheffield-Durham 0.5m telescope. The places are limited and selection will be made on past examination performance. Students who stay in Sheffield will be required to complete a traditional third-year astronomy project. If you are selected to go to La Palma you are required to submit an observational proposal quite early in the spring semester and you will be orally examined a few days later. Further details will be given to you at the first lab meeting, if you require any more information please contact Prof Dhillon, room E40.

### **Fourth Year Projects**

Fourth year MPhys students complete a 40-credit research project in the fourth year: the topic of this project may be physics-related or astronomical (PHY480). The procedures, requirements and assessment criteria for the astronomy projects are identical to the equivalent physics modules. You are expected to spend a third of your time on the project during the academic year. This usually breaks down as the equivalent of 10 credits in semester I and 30 credits in semester II.

## **4. Safety**

Before you begin your project work it is essential that you are fully familiar with the rules and procedures described in the links available from the Department's health and safety web page: <https://www.sheffield.ac.uk/physics/staff/safety>. Your supervisor will inform you if your work requires any specific safety precautions. In particular, if your project is likely to involve the use of lasers, X-rays, sealed radioactive sources or the handling of any potentially hazardous substances you must inform the **departmental safety officer (Mr Richard Davis)** who will arrange appropriate safety training. Before undertaking **any** experiment or other laboratory procedure you **must** obtain the permission of your project supervisor.

**NB: It is forbidden for undergraduate students to carry out any laboratory work outside normal working hours (9am-5pm, Monday to Friday, excluding Bank Holidays).**

## 5. Postgraduate Opportunities

The 3rd and 4th year provide the opportunity for students to obtain direct experience of the research work of the Department, and to discuss possibilities for postgraduate research with members of the academic staff. If you are interested in staying in Sheffield to carry out research for a PhD, and you expect to graduate with at least an upper second class degree, then you should contact the Postgraduate Tutor, Dr Dmitry Krizhanovskii (room E16), as early as possible in your final year.

## 6. Year Schedules

### Years 3 & 4, 2017/18

#### Semester 1 Monday, 25 Sep – Saturday, 3 Feb

|                |            |   |
|----------------|------------|---|
| <b>Week 1</b>  | Mon 25 Sep | Third year (and PHY341 Project) Meeting               |
| <b>Week 1</b>  | Mon 25 Sep | Fourth year (and PHY480 Project) Meeting              |
| <b>Week 1</b>  | Thu 28 Sep | <b>12:00</b> Deadline for Y3 project choices          |
| <b>Week 2</b>  |            | Y3 Project allocation/start project work              |
| <b>Week 12</b> | Fri 15 Dec | <b>12:00 Deadline for handing in project reports*</b> |

#### Christmas vacation 17 Dec – 15 Jan

|                   |            |                                     |
|-------------------|------------|-------------------------------------|
| <b>Week 13</b>    | Mon 15 Jan | Start of exam period                |
| <b>Week 13-15</b> |            | <b>Y3 Project oral examinations</b> |

## Semester 2 Monday, 5 Feb – Saturday, 9 June

|                |             |  |
|----------------|-------------|--|
| <b>Week 16</b> | Mon 5 Feb   | PHY342 Project Meeting                       |
| <b>Week 16</b> | Thurs 8 Feb | <b>12:00</b> Deadline for Y3 project choices |
| <b>Week 17</b> |             | Y3 Project allocation/Start project work     |
| <b>Week 18</b> |             | Semester 1 project feedback available        |

## Easter Vacation 24 March – 15 April

|                   |            |   |
|-------------------|------------|---|
| <b>Week 27</b>    | Fri 18 May | <b>12:00</b> Deadline for handing in project reports* |
| <b>Week 28</b>    | Mon 21 May | Start of exam period                                  |
| <b>Week 28-30</b> |            | <b>Project oral examinations</b>                      |

**\* NB Project reports handed in after these deadlines will be penalised by having the mark reduced by 5% for each working day they are late.**

Project reports handed in more than 5 working days late cannot be assessed at all.

You will be able to pick up 2 free binding covers from F10 in which to put your projects.

Third & fourth year project reports and laboratory diaries must be handed in together.

**REMEMBER TO CHECK YOUR E-MAIL AND THE 3rd AND 4th YEAR NOTICEBOARDS FOR FURTHER ANNOUNCEMENTS**