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Physics



Oxford Physics Freshers Guide

2011-2012



A scene from the Open Days

Published by the
Physics Joint Consultative Committee
(PJCC)

Dear New Physicist,

Welcome to Oxford! Congratulations on surviving A-Levels and getting into the University. Hopefully you will enjoy your time here – there is such a range of things to do, and friendly people to talk to, that it's difficult not to.

This guide is designed to give you an overview of what the course involves (the details are in the Undergraduate Course Handbook which will be given out at the beginning of term and can be found online) and aims to give you useful advice and insight. An extended version of this guide can be found on the PJCC webpage (www.physics.ox.ac.uk/pjcc).

This booklet covers the following:

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Preparation over the Vacation

The Physics Joint Consultative Committee (PJCC)

I hope you find this useful, and best of luck with your course,

Lauren Petrie (outgoing PJCC Chair)

The views and opinions expressed in this guide are those of the PJCC and not those of any college, department or the University.

Teaching Methods

Terms in Oxford (Michaelmas – autumn, Hilary – spring, Trinity – summer) are very short compared to other universities. The workload is intense and the pace is fast so it's easy to get left behind – all it takes are a few rehearsals, rowing outings, debating events or parties to mess up your schedule completely. You can have fun and do physics (!) but make sure you're organised with your time.

The holidays provide some respite from the rush of term but you will need to go over the work done during the previous term and read about the topics to be covered next term. Colleges normally provide a focus in the form of internal exams (known as collections) at the beginning of each term. These have no bearing on your final degree – they are simply to help you and your tutors find out how you're progressing. The seriousness of these exams depends entirely on your college. Some may make you do them again if you do badly, in the form of penal collections (which can ultimately lead to expulsion).

Tutorials

The focus of your work in Oxford will be the tutorial (or tutes as they are affectionately known). During the first year you will usually have two per week (one in physics and one in maths). A tutorial basically consists of an hour-long (or more) meeting between two or three students and a tutor, who is a practising physicist, either from your college or the physics department. You will mostly go over work handed in beforehand, but sometimes you will look at work to be covered in forthcoming lectures. Problem classes are also held on an irregular basis.

Tutors organise their tutorials in different ways. Many stick closely to the question sheets handed out in lectures, whereas some set their own questions. They may opt to introduce new material themselves or go over a technique a lecturer has covered from a new perspective. Having access to the core textbooks is very important as well, as tutors will often refer you to a chapter which is particularly relevant.

The beauty of the tutorial system lies in its flexibility. Your tutor will get to know you quickly and will be able to see where you are having problems, directing you as necessary. With only one or two other students present it is much easier to ask questions without feeling as if you are holding someone else up – try to make use of this as much as possible. Often a tutor can give you a reply to a question immediately for which you might otherwise have to spend hours of searching in books to find the answer. If you think of something outside a tutorial don't be afraid to email your tutor and ask them.

In addition to being an excellent way of learning the material, tutorials are an opportunity to talk with experienced physicists and learn about things that may be completely off the course. Nonetheless, these extra-curricular discussions are usually fascinating and provide you with a wider view of physics in general. If you ask them, they will probably also show you around their lab and might even help you to find a vacation placement to get a better insight into what actual research is like.

The tutorial system is very flexible. If you are unable to make a tutorial for sickness or otherwise, or find it difficult to hand a piece of work in for the same reason, get in contact with your tutor in advanced and they should re-arrange the tutorial so that you can catch up. Each tutor has a different policy and it is a good idea to find out what the tutor prefers.

Lectures

For most students the lectures are the primary source of information, especially during first year since they cover all Prelims material more concisely than in any textbook. These lectures are all in the Physics department, and the lecture timetables are online. The best thing to do is to go to the first few lectures to get a feel for what they are like and act accordingly based on your own preferred style of learning. Some lecturers produce reading lists with references to specific books and chapters with each problem set and an accompanying set of notes. These and more useful stuff can be found on lecturers' web pages via www.physics.ox.ac.uk/lectures. It is up to you if you prefer to annotate the existing notes during lectures, or make your own entirely. Most of the more mathematical subjects require copying what is written on the blackboard and if you do not attend you have very little information whatsoever. Attendance is very much advised!

Question sheets are usually handed out at lectures. These are exercises based on the material covered which your tutors will probably set you. You have plenty of time to go over the lectures and questions with textbooks that may well devote a whole chapter to something the lecturer has taken only five minutes to explain. Your tutor will also help you with things you do not understand regardless of its relation to the week's set work.

At the end of each term you must fill out an online lecture feedback questionnaire. The results are taken into account by the individual lecturers (and they will usually make changes according to them) and are discussed with the faculty in the PJCC meetings. You should use this chance to improve the course and comments are particularly useful.

Learning from Textbooks

A very important skill that you need to acquire at university is independent learning. It becomes more essential as the course progresses so try to learn it early on and do not make the mistake of relying only on lectures. Reading the relevant sections of various textbooks will give you a deeper understanding and will ensure you know the topic more thoroughly. Sometimes new topics must be learned entirely from textbooks; for example for a practical or if you have missed several lectures through illness. Often tutors will set work before the relevant lectures have been given. This is a good opportunity to read ahead and means that you learn a lot more when the actual lecture detailing the work comes up.

Finally it is always a good idea to meet up with other physicists from your year to go over the material covered in the course – especially for exams revision. You will notice that some problems can be solved much more quickly that way and that explaining a topic to others helps you to get a more clear idea of it yourself.

The Course

Full descriptions of the courses and the exam papers are given in the Undergraduate Physics Handbook, although attending the lectures soon gives you a taste of what each one is like. The handbook gives a list of topics on each course that are examinable (the Syllabus). It is worth checking these against some of the topics given to you by the lecturers. Previous exam papers can be found on www.physics.ox.ac.uk/expapers - however examiners and the syllabus may change from year to year.

First Year

The first year of the course is quite mathematical, which may come as a shock, particularly compared to A-Level physics. What you are effectively doing is learning a language, which is used in the rest of the course to describe the world we see around us. This allows you to solve problems properly – however you should always try to then see the physics behind the equations and results you get. You also learn the foundations of some of the most important branches of physics.

There are exams (Prelims) that you are required to pass at the end of your first year. Prelims have no bearing on your final degree classification although if you do very well (exact requirements vary from year to year) you may be awarded a Distinction. Some colleges may also award a scholarship to the tune of two hundred pounds (depending on your college) on performance in this examination. The papers are as follows:

Compulsory:

CP1: Physics 1

CP2: Physics 2

CP3: Mathematical Methods 1

CP4: Mathematical Methods 2

Short Options:

S01: Functions of a Complex Variable

S02: Astrophysics: From Planets to the Cosmos

S03: Quantum Ideas

Students take the four compulsory papers and then choose one of the short option papers. The astrophysics option may be included as part of your second year and Functions of a Complex Variable may be done as part of any year, but obviously you cannot do the same course twice. Some information about the different options and useful books can be found on www.physics.ox.ac.uk/pjcc.

The pass mark for each paper in Prelims is around forty per cent. A minority of physicists will fail one or two papers but you get a chance to retake them in September... Although spending the summer revising for exams that you have to pass to stay in Oxford cannot be pleasant! Students will be sent down (made to leave) if they fail these September resits.

Subsequent Years

During the second and third years the course concentrates on the standard areas of physics, focussing more on the physics itself rather than the maths. Mathematics is used extensively but as a tool rather than being studied for its own sake. Exams remain in Trinity Term of the second and third years, covering the Part A and Part B syllabuses respectively.

For Part A there are 3 papers:

- A1: Thermal Physics – Kinetic Theory, Heat Transport, Thermodynamics and Statistical Mechanics
- A2: Electromagnetism and Optics – more advanced than in the 1st year
- A3: Quantum Physics – foundations and applications to certain systems (e.g. Hydrogen)

There is also a short option examination paper. There are a number of short option topics such as Chaos, Energy Studies, Plasma Physics or a language option. Only Quantum Ideas is restricted to Prelims.

For Part B there are 3 papers:

- B1: I. Flows, Fluctuations and Complexity, and II. Symmetry and Relativity
- B2: III. Quantum, Atomic and Molecular Physics, and IV. Sub-Atomic Physics
- B3: V. General Relativity and Cosmology, and VI. Condensed-Matter Physics

The four-year MPhys differs from the three-year BA in that you take all three papers for Part B, whereas for the BA you take four sections (I – VI) from the three Part B papers and do a project.

In the Part C course, taken in the 4th year of the MPhys, you do two courses in a specialised area of physics and an extended project.

You will not have to choose between the BA and MPhys until after the results of the Part A exams are published. You will need to achieve a II.i (2.1) after Part A in order to proceed to the MPhys.

The Practical Course

Physics is a practical subject and doing experiments is an important part of the physics course in Oxford. This is an outline of the Practical Course; you'll be given a more comprehensive guidebook by the Physics Department during the first week of term, and there will also be a safety lecture regarding practicals.

Practicals are done in pairs, usually with someone from your college, although if your college admits an odd number of students you may be with someone from another college. Working in pairs really helps; it gives you someone to talk about the experiment with and makes setting up the equipment a lot easier.

For each practical, you are provided with a detailed script including instructions telling you what to do, technical details about how to set up the apparatus, all the relevant theory, and questions relating to the theory. All the scripts can be viewed online and printed; it's

essential to read though script before your lab day to give you an outline of what you will be doing. This will help save time at the beginning of the day and you may finish early.

The labs are staffed with ‘demonstrators’ and a few senior members of staff. Demonstrators are usually post-graduate Physics students and some will have gone through the Practical Course as undergraduates. They are there to answer questions, explain things you don’t understand and help set up your experiments. Frequently the experiment will involve Physics that you have not yet studied. Thankfully the demonstrators are understanding and will accept that it may take longer for you to get your head around it.

At the end of the term you can give feedback about the different practical labs and you can also comment on individual experiments (using the “Management Scheme” which you will get to know very soon...) – this will be useful for others when choosing which experiment to do and constructive comments and ideas will also help to improve the practical course.

First Year

During the first year you will spend one day in the labs each week. The requirement for the first year is fifteen days of practicals, which means that you don’t have to do any in Trinity term. Try not to get behind with practicals; although if you miss one you can catch up at the end of Hilary Term. The Prelims practicals are grouped into 5 different areas: Optics, Electronics, Electrostatics and Magnetism, Computing and “General” (mostly Mechanics).

First year experiments are done on either Thursday or Friday; you have from 10am till 5pm to get it done. It is not a pressurised environment and if you have been working well during the day then you won’t be made to stay after 5pm.

Subsequent Years

In the second and third years you spend 2 days every fortnight in the labs, so you can do longer experiments. You alternate between practical weeks, which are fairly hectic, and non-practical weeks, which are quieter. The choice of practicals is wider than during the first year, so you can chose the practicals you find most interesting. You will also complete an extended project during the final year of your degree.

There are a number of possibilities to replace some practicals by other courses; for example, an extra ‘Short Option’ paper. ‘Teaching and Learning Physics in Schools’ is another option; this involves working in a local secondary school helping to teach Physics.

Libraries and Books

There is no single textbook that covers all the material on the course so it is necessary to use a variety of books for each aspect of the course. Many books go well beyond the level required, and there are two options available when it comes to acquiring them: buying them or using the university or college libraries. Oxford's extensive library system is unique (apart from maybe "the other place") and if your college library is good, you will rarely need to spend money on books. If you find it necessary to buy a book, try to get it in the second hand section of a bookstore or from someone in a higher year. Some colleges may repay you some of the cost of buying books - so keep the receipts.

College Library

Your college library should have most of the books you need for the course and will stock multiple copies of the most frequently used. Your tutor or librarian will usually order more copies if there are not enough, and you can request books to be bought that are not stocked.

Radcliffe Science Library (RSL)

Part of the Bodleian Library, which by law gets copies of every book printed in the United Kingdom, so it's bound to have what you're looking for. More details about the RSL and lending services can be found at <http://www.ouls.ox.ac.uk/rsl> and http://www.ouls.ox.ac.uk/rsl/services/lending_services.

Preparation over the Vacation

You may have been given vacation work and a reading list as part of the recommended preparatory work; try to finish your vacation work before you arrive in Oxford – there are a lot of things to do in "Freshers' Week"! It is useful to loan or buy at least some of the books from the list and begin reading them. It is helpful to read over your A-Level notes, especially those on maths, and re-familiarize yourself with topics like integration, differentiation and so on since advancement of these will be one of the main features of the first year course.

If you didn't take Further Maths A-Level you should be aware that while the first two weeks of lectures will be revision for most, they may be new topics for you, so you will have to work hard to make sure you grasp these fully. If you find yourself struggling, you should ask your tutor for help or advice.

The Physics Joint Consultative Committee (PJCC)

The committee consists of student representatives (reps) of the Physics undergraduates and representatives of the Physics Faculty. A special needs representative may also sit on this committee. It meets twice a term (in second and seventh weeks) to discuss ways to improve how Physics is taught at Oxford, suggestions and complaints from students, changes in the course, exam matters, etc.

To contact us (the student members), you can either use the form on the webpage (www.physics.ox.ac.uk/pjcc), email us by clicking on our names on the Committee page or just talk to your “year rep” or someone else on the committee directly. All your comments will be taken seriously and can be handled anonymously if you want to. If you are interested in participating in the PJCC please contact the PJCC Chair.

It is important that many people contact us so we can get a balanced set of views. We also hold open meetings, details of which are circulated by email, so please come if you can. If you have a problem or a good idea, let us know – that way things can be improved.

Each term every physics student fills in a web-based questionnaire about the lectures they have attended. The results, including marks for various categories and a summary of the comments for each lecturer, are collated and passed on to the department. The numerical feedback results, along with the minutes of previous meetings, are displayed on the webpage. The comments are not displayed and remain anonymous, so please take this opportunity to tell us what you think. The completion of these questionnaires is compulsory, as the results are taken seriously.

The PJCC webpage (www.physics.ox.ac.uk/pjcc) also contains useful links (with reading recommendations, good physics websites and handy programmes) and help for finding vacation placements.

PJCC Student Committee Members (from Michaelmas Term 2011)

Andrew Wilson (Chairman)	St Hugh’s College
Lauren Petrie (outgoing Chairwoman)	Lady Margaret Hall
Sentooran Sanmugarajah (Secretary)	Merton College
Christian Schroeder (Webmaster)	Exeter College
Gorkem Cavli	Magdalen College
Michael Cairns-Terry	Jesus College
Rohini Giles	Hertford College
Lucy Hutchinson	Mansfield College
Matthew Donora	St. Edmund Hall
Claudia Clarke (PhysPhil)	Trinity College