Physics and Philosophy

Course Handbook

Academic year 2021 – 2022

Disclaimer:
The Examination Regulations relating to this course are available as follows:

- **Prelims**
  www.admin.ox.ac.uk/examregs/2019-20/peiphysandphil/studentview/
- **Finals Part A**
  www.admin.ox.ac.uk/examregs/2019-20/hsopandphil/studentview/
- **Finals Part A**
  www.admin.ox.ac.uk/examregs/2019-20/hsopandphil/studentview/
- **Finals Part C**
  www.admin.ox.ac.uk/examregs/2019-20/hsopandphil/studentview/

(The regulations applicable to you are those in place at the date you begin your course (for Prelims) or begin the honour school (for Finals). The dates given in these links may not be applicable to you if you have taken a year out at any stage.) If there is a conflict between information in this handbook and the Examination Regulations then you should follow the Examination Regulations. If you have any concerns please contact carrie.leonard-mcintyre@physics.ox.ac.uk.

The information in this handbook is accurate as at **8 October 2021**; however it may be necessary for changes to be made.

If this happens the department will publish a new version of this handbook together with a list of the changes and students will be informed

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1 Introduction

Physics and Philosophy (PP) is a relatively small school at Oxford, but there is a thriving physics and philosophy community all the same; dispersed though it is among the colleges, you will find that there are frequent opportunities to meet with others on the course. You should introduce yourselves on your arrival at Oxford, to each other and to some of the faculty whom you will be seeing regularly throughout the course.

Get to know your fellow physicists. Normally, students attend the induction for all students entering physics degree courses (including PP). This is normally held on the Friday of the week before full term begins ("0th Week"). The programme will be in person and available online at Canvas to be viewed remotely.

Get to know your fellow PP students. The Introductory Meeting for Physics and Philosophy, see Canvas for details. There is normally also an annual PP Tea Party at the beginning of Trinity Term, details will be published when available.

Get to know your fellow philosophy students. Your college probably has students doing most or all of: Classics, Computer Science and Philosophy, Philosophy, Politics and Economics (PPE), Philosophy and Theology, Maths and Philosophy, Philosophy and Modern Languages, or Psychology, Philosophy and Linguistics. All are joint Philosophy courses; most of them overlap with your Philosophy syllabus to a greater or lesser extent.

Coronavirus (Covid)

The University publishes updates on their webpages. Adaptations to the physics undergraduate course, may be necessary due to, e.g. Coronavirus (Covid) etc. and will derive from the university guidance and be published at course information updates. The Philosophy publish changes to philosophy lectures.

Using this book

The Course Handbook is intended to give you the essential information about the degree course; much more information is available online at the Physics and Philosophy websites, and you will also want to consult the Physics course handbook. The next two sections deal with teaching and with assessment; after that, there is a section on each year of the degree course; finally, there is a section on various problems that might (though we hope won't) arise on your course.

Really, you should read the whole handbook now (it's quite short; you'll have to read much longer things on this course!). But you should at least begin by reading sections 2 and 3 (on teaching and examining) and section 4 (on the first year). Later, you'll want to look at the sections on each year of the course *well in advance* of starting that year.

Comments on this Handbook, as on any other aspect of the course, are welcome. The Course is run by a Committee, the Joint Standing Committee for Physics and Philosophy, with members from both the Physics department and the Philosophy faculty, and a student representative. The student representative usually serves for one or two years, and is elected at the Tea Party referred to above. The Committee approves all the regulations governing the course and reviews the exam reports that indicate how well the course is running.

Contact details for the Joint Committee are as follows:

Chair:	Dr Adam Caulton (Philosophy) adam.caulton@philosophy.ox.ac.uk
Student Representative:	Yixuan (Wendy) Dang (Balliol) yixuan.dang@balliol.ox.ac.uk

2 Teaching

Your tutors

Anybody to whom you go for tutorials or college classes counts as one of your tutors. In Physics and Philosophy there are bound to be at least two of them, and there are likely to be six or more over the four years. Some will be Tutorial Fellows or Lecturers of your own college; some may be Tutorial Fellows or Lecturers of other colleges, or Research Fellows, or graduate students. The overall responsibility for giving or arranging your tuition will lie with the Tutorial Fellows or Lecturers of your own college, probably one in each of Physics and Philosophy.

It will probably be a rule of your college that you call on these in-college tutors at the beginning of term to arrange tuition, and at the end of term to arrange vacation reading and next term's subjects. In any case it is a very good idea to pay such calls, if necessary on your own initiative. Colleges have different rules about when term 'begins'. The official start for University purposes is Sunday of First Week of Full Term, but you will almost certainly be required by your College to be back by some day in the middle of 0th week. You should try to ensure that by the Sunday you know who your tutors for the term will be, have met or corresponded with them, and have been set work and assigned tutorial times by them.

Tutorials

The arrangement of Tutorials is the responsibility of your college. The tutorial system at Oxford provides highly personalised guidance on your studies — in particular to give you feedback on your written work and on problem-solving exercises — but it only functions properly if you prepare for them well. Tutorials are not individualised lectures, they do not provide synopses of topics or of books. For the great majority you will have written an essay or completed a problem set, and invariably you will have studied a prearranged topic: in tutorials your own reasoning and argumentation will also be searchingly scrutinized.

What you are expected to bring to a tutorial is knowledge of the reading which was set for it, and answers or at least attempted answers to problem sets. What you have a right to expect is your tutor's presence and scholarly attention throughout the hour agreed, plus guidance, e.g. a reading list, for next time, and feedback — which may be verbal or written — on any work you have produced. Beyond that styles differ, depending on how many students are sharing the tutorial, the nature of the topic, and above all the habits and personality of your tutor. You must not expect uniformity, and you will gain most if you succeed in adapting to differences.

You will normally have more than one tutorial a week — on average two — and you can expect to be set written work for every tutorial. Some of it, especially in philosophy, will be tutorial essays. You will quickly learn what is expected, though it may take many terms' practice to perfect your technique of getting a philosophical argument across.

Work on a tutorial essay involves library searches, reading, thinking, and writing, and it will take a minimum of two days — often three — to do properly. Read attentively and thoughtfully, skipping bits that obviously do not bear on your topic: one hour of that is worth many hours of 'summarising' paragraph by paragraph with the music on! As your reading progresses, think up a structure for your essay (but do

not write an elaborate plan which you won't have time to execute). Expect to have to worry out your thoughts, both during and after reading. Use essays to develop an argument, not as places to store information. As you write, imagine that the audience is not your tutor, but people you are seeking to interest and instruct — e.g. one of your peers. You will learn a lot if you share ideas with fellow students, and if you chance your arm in tutorial discussion. Remember that tutorials are not designed as a substitute for lectures, or for accumulating information, but to teach you how to think, write and argue in a clear and articulate way. You should take notes during a tutorial, but mainly they should concern the feedback you are getting on your written arguments.

Some tuition is by means of College classes, a system specially suited to subjects in which your written work is exercises. In these cases, just as for tutorials, attendance is compulsory. In philosophy, colleges often use classes for logic teaching.

Oxford trains you as a writer to meet deadlines; so equip yourself with a writer's tools — a dictionary, such as the Concise Oxford Dictionary, and, unless you are very confident, a thesaurus and Modern English Usage.

Lectures

Each term lecture lists for Physics and Philosophy are published on the respective websites which cover all physics and philosophy lectures. You can find these at

- Philosophy — www.philosophy.ox.ac.uk/lectures
- Physics — www.physics.ox.ac.uk/lectures

Lectures form the backbone of the Physics and Philosophy course, and are there to present you with an overview of a given field in philosophy or physics. Although core lectures are not compulsory, you may be seriously disadvantaged in examinations if you have not attended them: it is the material covered in lecture courses (not courses of tutorials) that dictates the questions set for examinations. The core lectures in philosophy correspond to particular philosophy subjects and their associated examination papers (and are usually named after them); they are clearly marked as such in the Philosophy Lecture Prospectus and the Philosophy Lecture List on the Philosophy link above. Philosophy lectures are generally given in the Philosophy Faculty Centre in the Radcliffe Humanities Building, or in the Examination Schools on High Street.

The core lectures in physics in the first three years of the course are given in one of the larger lecture theatres in the physics department, the Martin Wood or the Lindemann (both in the Clarendon Laboratory). Each core paper has one or two associated lecture courses. Learn to take notes at lectures; they will be useful to you later, when you can fit them into a wider picture.

Vacations

British degree courses are among the shortest in the world. They hold their own in international competition only because they are full-time courses, covering vacations as well as terms. This is particularly true of Oxford, where the eight-week terms (called Full Terms) occupy less than half the year. Vacations have to include time-off

from study, and very likely they include time-off to earn money, but still study in vacations is vital to completing the degree.

Sometimes you will be assigned specific tasks to do in vacations, but you should always review the material you have learned the term before. Often, you will have to sit a college exam (a "collection") on this material at the start of the next term.

Libraries

The library provision in Oxford University is very good but can seem rather complex. Physics & Philosophy students will need to use a variety of libraries during their time in Oxford. The main ones relevant to you are:

- Your college library. This will have a good selection of books which can be borrowed, although it doesn't have the same provision as the main University library system. You can only use *your own* college library: you can't borrow from another college.
- The Philosophy and Theology Faculties Library, in the Philosophy Faculty Centre (part of the Radcliffe Humanities Building on Woodstock Road). This is a lending library directed specifically to the needs of undergraduates. You should enrol there as soon as you can — there will be an library induction meeting in 0th week, but if you miss that you should enrol as soon as possible. Its holdings in philosophy subjects that you will study for the PP degree are quite comprehensive.
- The Bodleian Library: this comprises several linked buildings— the Old Library, the Radcliffe Camera, the underground Gladstone Link which joins them, and the Weston Library. The Bodleian is a reference library with a very extensive philosophy collection.

You will also find that almost all journal articles, and increasingly many books, are available online. You can search the entire Oxford library system from the central library website at the finding resources page of the Bodleian Library website. In particular, *SOLO* is the University's unified catalogue, and *Oxford University e-journals* is a gateway to its collection of electronic journals. Looking at a library's web page can provide you with further information about specific services or the rules and regulations of each library.

Academic Good Practice and Plagiarism

There is a lot of good advice about Academic Good Practice on the relevant section of the University Website. In particular there is a separate page devoted to the definition of and guidance relating to *plagiarism*. Plagiarism is the copying or paraphrasing of other people's work or ideas into your own work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Collusion is another form of plagiarism involving unauthorised collaboration of students (or others) in a piece of work. Cases of suspected plagiarism in assessed work are investigated under the disciplinary regulations concerning conduct in examinations. Intentional or reckless plagiarism may incur severe penalties, including failure of your degree or expulsion from the university.

3 Assessment

College assessment

Your tutors will give you some feedback — either oral or written — on any work you produce for them. Some tutors may give you a numerical mark, but not all will — and tutorial essays shouldn't be thought of just as mock exam papers: they have a different purpose. If you have handed in work and not got some kind of feedback on it within a week or two, it's worth reminding your tutor.

At the end of each term you will be given a report on your progress in tutorials and classes, but your tutor is not formally examining you, and your tutor's opinion of you plays no part in determining the class of your degree — your tutor is there only to assist you in your studies.

Most colleges will require you to sit college examinations, 'collections', before the start of each term. The objects are to test your comprehension of work already covered, and to practise you in writing timed papers. Make sure at the end of each term that you know the times and subjects of next term's collections. You have a right to expect collections to be marked and returned to you with comments, usually within about three weeks of your sitting the collection.

University exams

Your degree classification is based entirely on the University's (not the College's) assessment of your performance, and that performance is mostly assessed through exams at the end of each academic year. It is your personal responsibility to enter for University examinations, and if you enter, or change your options, after the due date, you must pay a late fee and gain the examiners' consent. Entry is through colleges, and in most colleges, the college administrative staff will ensure you enter on time. You will be sent a timetable for each set of exams in the term when you sit them; you can also check on the University's Academic Services website.

The exams at the end of the first year ("Prelims") determine whether you can continue into the second year, but don't count towards your final degree class. Possible results are Distinction, Pass, Pass in some papers, or Fail; if you fail some or all papers, you have to re-take the corresponding papers in a repeat examination in September, unless you fail more than one of the three physics papers, in which case you must re-take all three physics papers. Once you pass in all your papers (either in June or September), you are said to have "completed the First Public Examination", and can go on into the second year.

The exams at the end of the second, third and fourth years are all called "Finals", and together they determine your degree class: possible results are Class 1 ("First"), Class 2 Division 1 ("2:1"), Class 2 Division 2 ("2:2"), Class 3 ("Third"), Pass, or Fail.

At University examinations, you *must* wear academic dress with sub-fusc clothing. If you don't know what it is, follow the link! You really don't want to be denied entrance to your exams!

All aspects of the conduct of University Examinations are covered by the *Examination Regulations*. These include regulations on:

- the typing of illegible scripts (Part 16) (NB: 'the cost of typing and invigilation shall not be a charge on university funds');

- the use (where permitted) of calculators in examinations; the use (where permitted) of computers in examinations; and a general prohibition on the use of dictionaries (Part 10);
- the use of word-processors in examinations (Parts 10 and 12);
- candidates with special examination needs or specific learning difficulties (Part 12).

If you have any problems connected with University examinations which you want to take further, never approach the examiners directly; ask your college tutor, who will take the matter forward to your college's Senior Tutor, or ask the Senior Tutor directly. The Examiners are statutorily forbidden to accept communications from individual candidates except through the Proctors, who respond to cases raised by Senior Tutors. This applies to complaints too (although every student has a statutory right to consult the Proctors directly on any matter at any time in their Oxford career). The regulations for PP Prelims and Finals are in the online *Exam Regulations*. However note that the online *Regulations* require an applicable year to be supplied: this is the year of matriculation (for Prelims) or the year you began working for the Final Honour School (for Finals); see this page for more detail.

Marking and Classification

This section deals with procedures and conventions applied by examiners in the process of marking scripts and assigning results in Finals. The examiners mark using criteria drawn up by the Philosophy Faculty and the Physics Department, but they have a large degree of autonomy in their decisions.

Each paper you write is marked out of 100. A mark of 70 or higher is first class, 60-69 is 2:1, 50-59 is 2:2, 40-49 is third class, and anything below 40 is a failing mark. You can find more information about the way individual papers are marked in the physics handbook (for physics) and here (for philosophy).

Your overall classification is based on the weighted average of your marks:

- The papers you do at the end of the 2nd year (which are all physics papers) get a total weight of 2;
- The papers you do at the end of the 3rd year (which are a mixture of physics and philosophy) get a total weight of $5\frac{1}{2}$;
- The papers you do at the end of the 4th year (which will be physics, philosophy, or both) get a total weight of 4.

The simplest way to get a First is to perform, on average, at the First class level: that is, to get a weighted average of 70. But you can also get a First if you have a weighted average of 70 in *either* physics, *or* philosophy, provided that you get at least an average of 67 overall, and that the majority of your papers are in your stronger subject. Similarly, you can get a 2:1 either by getting a weighted average of 60 overall, or by getting a weighted average of 60 in one subject or the other and a weighted average of 57 overall. More details of the classification rules can be found here.

4 The First year: Prelims

Syllabus and Examinations

PP Prelims consists of five written papers: three in Physics, each of $2\frac{1}{2}$ hours, and two in philosophy each of three hours. There are no optional papers in the first year.

The three papers in physics and mathematics are: CP1 Physics 1, CP3 Mathematical Methods 1 and CP4 Mathematical Methods 2. CP1 deals with mechanical principles expressed in more abstract and mathematical ways than you have probably been used to, and also provides a first introduction to Special Relativity. Your preparation for CP3 and CP4 equips you with the concepts you will need to study field theory and quantum mechanics: differential and integral calculus in one and more variables, complex numbers, vectors and matrices, and the mathematics of wave motion. The detailed syllabuses for CP1, CP3 and CP4 are given in Appendix C of the Physics Undergraduate Course Handbook. See the First Year (Prelims) *Handbook* also for a guide to the schedule of lectures, including the Induction and Safety meetings. Note that you do not have to undertake any experimental work in your first year; however you *can* if you wish, provided you have been to the Safety lecture; otherwise you must attend at the beginning of your second year.

Philosophy teaching will be arranged for you by your college tutor in philosophy. Philosophy has three distinct elements in the Prelim: Elements of Deductive Logic, General Philosophy, and the Leibniz-Clarke Correspondence. There are two papers in the examination: the Elements of Deductive Logic, and Introduction to Philosophy, which combines General Philosophy and the Correspondence. Elements of Deductive Logic is a course common to the joint degrees of Philosophy with Physics, Mathematics, and Computer Science. It is taught in Hilary Term, usually in classes (though tutorials are not uncommon, and just as good). Lectures specifically for this course take place in Hilary, though students must also attend, as preparation for them, the lectures on Introduction to Logic in Michaelmas Term, and should attend college classes on this. Lectures on General Philosophy take place in Michaelmas Term, and those on the Leibniz-Clarke Correspondence fall in Trinity. These subjects are taught in tutorials, which may take place in any of the terms throughout the year, depending on your college's teaching arrangements. The lectures for the Leibniz-Clarke Correspondence are intended especially for Physics and Philosophy students. You should take opportunities at these lectures to meet students from other colleges and broaden your circle. The lectures are typically delivered by philosophers who specialize in the philosophy of physics, or philosophy of science, whom you are likely to meet again and again over the course of your degree.

First Year Sample Timetable

1st year philosophy

MT	Lectures	Introduction to Logic (as for PPE); General Philosophy
	Tutorials / Classes	Introductory Logic(8 classes) General Philosophy (4 tutorials)
HT	Lectures	Elements of Deductive Logic
	Tutorials	Elements of Deductive Logic(8 classes); General Philosophy (4 tutorials)
TT	Lectures	Leibniz-Clarke Correspondence
	Tutorials and classes	Leibniz-Clarke (4 tutorials)

1st year physics

MT	Lectures	CP1 (Physics 1); CP3 (Mathematical Methods 1); CP4 (Mathematical Methods 2)
	Tutorials / Classes	CP1 (3-6); CP3 (3-4); CP4 (3-4)
HT	Lectures	CP1 (Physics 1); CP3 (Mathematical Methods 1); CP4 (Mathematical Methods 2)
	Tutorials / Classes	CP1 (3); CP3 (4); CP4(2-4)
TT	Lectures	Revision for CP1, CP3, CP4
	Tutorials / Classes	CP1 (2); CP3 and CP4 (4)

Your college tutors may vary your timetable; if they do, make sure you understand what the overall structure of the year is at your college.

5 The Second Year: Part A

Syllabus and Examinations: Physics

You take PP Finals Part A at the end of Trinity Term of your second year. It is entirely Physics: there is no examination on Philosophy work until the Part B examinations in the third year, although you will work towards Part B philosophy in both the second and third years.

The Part A examination consists of three physics papers:

A1: *Thermal Physics* (three hours);

A3: *Quantum Physics* (three hours);

A2P: *Electromagnetism* (1 hour 40 min.).

The syllabuses for A1 and A3 are the same as for Physics Part A and are given in Appendix D of the Physics Undergraduate Course Handbook. The syllabus for A2P is the same as that for Paper CP2 in Physics Prelims but without the topics in circuit theory or optics (see Appendix C of the First Year (Prelims) *Handbook*). As usual the formal regulations are in the *Examination Regulations*

The practical requirements in the Physics and Philosophy Finals Part A is three days of practical. The experimental work is as follows: two half-day introductory practicals in the first two weeks of Michaelmas Term (EL00 *Oscillators, Digital Multimeters and Oscilloscopes* and DA01 *Introduction to Data Analysis*), plus practicals (GP14 *Free and bound electrons* and OP25 *Stern-Gerlach effect.*

Before you can do any experiments you must have attended the Safety Lecture in the Physics Department (you may have done so in your first year, but if not then please be sure to attend in your second year) and completed two half-day training sessions: DA01 and EL00 . The safety lecture is normally given on Monday of First Week of Michaelmas Term at 14:00 in the Martin Wood Lecture Theatre where you will be asked to sign a safety declaration. Full details of how to find a partner if you need one, and how to book, are in the Part A Practicals course on Canvas.

A completed experiment is one that has been performed, assessed as satisfactory by a demonstrator and the grade entered in the student's computer record. A report on your performance is sent to the Finals Examiners at noon on Friday of 5th week Trinity Term. It is your responsibility to make sure your computer record is accurate and up-to-date.

Full details of how to find a partner if you need one, and how to book, are in the Part A Practicals course on Canvas.

Also as part of the requirement forPhysics and Philosophy Finals Part A, in Hilary Term of your second year you must give a short talk (as do the physicists). This is intended as an exercise to help you develop your skills in oral communication and does not count towards your degree. It will be assessed by your college tutor, and will be preceded by a lecture in the Physics Department giving guidance on how to give a talk. As an alternative to this you can instead take the Physics in Schools option which involves some classes on teaching physics, and some time in local secondary schools. For more details on this option see the Physics Handbook.

There is one more very important point to note about the second year Physics course, concerning Mathematical Methods. There is a 20-lecture course on this in

Michaelmas Term of the second year, the syllabus for which is given in Appendix D of the Physics Handbook, and a 6-lecture course on Probability and Statistics. This material is not attributed to any specific paper in Part A, but "short questions on mathematical methods will be set on one or more of papers A1, A2 and A3" (A2 and A3 are the ones required for PP). Further, "one long question on mathematical methods may be set in one of papers A1, A2 and A3". PP students are strongly advised to take this Mathematical Methods course very seriously, as it underpins all the theoretical parts of the physics course.

Syllabus: Philosophy

Your second and third year philosophy work is examined together at the end of the third year. There are three "core choices" (everyone must do these), and one "elective choice" (you can either do this, or more physics). The elective choice is almost always taught in the 3rd year, so it's discussed in that section.

Your core choices are as follows (note that all Philosophy Finals papers have a 3-digit code to identify them):

1. A core Philosophy paper. This can be *either* Knowledge and Reality (102) or Early Moderm Philosophy (101). In either paper, you will be studying core questions of metaphysics and epistemology: questions about existence, modality, time and identity (metaphysics), and questions about truth, knowledge, and observation (theory of knowledge, or epistemology). The choice between the two papers is to a large extent about two styles of learning: one organised around specific ideas, the other around specific texts. Both have value (and nothing prevents you doing the other one of the two papers later in the course).

2. A Philosophy of Science paper. This is normally Philosophy of Science (124). Philosophy of Science and Social Science (106) is still allowed, but this is not recommended, and will not be allowed in future years. Philosophy of Science is concerned with questions about what science is and how it connects to the world: are our scientific theories guides to truth, or are they just pragmatic ways of organising our observations? In what sense is science a rational process, and what is scientific method?

3. Intermediate Philosophy of Physics (120). This comes in two halves: Philosophy of Special Relativity, and Philosophy of Quantum Mechanics.

In the second year you will normally study the core philosophy paper, along with the Special Relativity half of the Intermediate Philosophy of Physics paper, but some colleges take the philosophy material in a different order.

Teaching

In Physics, teaching for Part A papers consists of lectures together with a mix of classes and tutorials, according to your college's overall teaching arrangements.

Teaching for the Philosophy part of your second (and later) year consists of lectures and tutorials (and occasionally classes). You should normally have eight tutorials, and a full course of lectures, in each philosophy subject that you study, though the level of tutorial provision can vary according to what your tutors prefer. Your college tutors will arrange the tutorials for you but it is your responsibility to attend appropriate lectures. Normally you should attend the lecture courses for Knowledge and Reality or Early Modern Philosophy in your second year, the part of the Intermediate Philosophy of Physics lectures that deals with Special Relativity in your second year, and the part that deals with Quantum Mechanics in your third year. Note that the physics lecture list is arranged to minimise clashes with the core philosophy paper in the second year, and the Philosophy of Science paper in the third year, so you should go to the lectures in these years regardless of whether you are taking the tutorials in the same year — for philosophy it is often fruitful to take the lectures at a *different* time from the tutorials in any case!

Second Year Sample Timetable

2nd year philosophy

MT	Lectures	Students should consult their tutors on lectures relevant to their core philosophy paper and to their philosophy of science paper.
	Tutorials	101/102 (4)
HT	Lectures	Intermediate Philosophy of Physics (Special Relativity) and other lectures as advised by tutors.
	Tutorials	101/102 (4)
TT	Lectures	As advised by tutors
	Tutorials	Intermediate Philosophy of Physics: Philosophy of Relativity (4)

2nd year physics

MT	Lectures	A1 (Thermodynamics); A3 (Quantum Mechanics); Mathematical Methods (see under section 5)
	Tutorials	A1 (4-7); A3 (2); Mathematical Methods (4)
HT	Lectures	A2P (CP2) (Electromagnetism); A1 (Statistical Mechanics); A3 (Quantum Mechanics; Further QM)
	Tutorials	A2P (2-5); A1 (3-4); A3 (4-6)
TT	Lectures	A3 (Further QM); A2P (CP2) (Electromagnetism revision)
	Tutorials	A1 (1); A2P (1); A3 (2)

Your college tutors may vary your timetable; if they do, make sure you understand what the overall structure of the year is at your college.

6 The Third Year: Part B

Syllabus and Examinations

The examination for Physics and Philosophy Part B consists of a Physics and a Philosophy component, as well as an elective paper which can be either Physics or Philosophy. The formal requirements are given in the Exam Regulations.

Physics: Important Note: *Two subjects in Physics and Four subjects in Philosophy* ***OR*** *Four subjects in Physics and Three subjects in Philosophy.*

The physics component in Part B is chosen from the following list of seven written papers (examined as a half-paper of 2 hours) and two project options :

B1 *Fluids*;

B2 *Symmetry and Relativity*;

B3 *Atomic and Laser Physics*;

B4 *Nuclear and Particle Physics*;

B5 *General Relativity*;

B6 *Condensed Matter Physics*;

B7 *Classical Mechanics*;

B8 *Computational Project*;

B9 *Experimental Project.*

You will have to choose two or if your elective paper is in physics, four of them. In both cases your choice must include at least two of subjects B2, B5 and B7. Subjects B1-B6 are the same as the core Part B physics papers taken by MPhys students, and the syllabuses are given in Appendix E of the Physics Handbook. The syllabus for subject B7 *Classical Mechanics* is given in Appendix F of the Physics Handbook, with the Physics Short Option syllabus of the same name, but note that it includes material which is non-examinable for the Physics Short Option. The B7 paper is specially set for PP students, and is 2 hours in length unlike the Short Option papers.

Philosophy: The Philosophy component consists of the three core parts described above (a core philosophy paper, a philosophy of science paper, and Intermediate Philosophy of Physics), each of which is examined in a three-hour paper. If the elective paper is taken in Philosophy, it is again examined in a three-hour paper, and is chosen from the general list of Philosophy papers in all Philosophy joint schools. There are more than twenty of these papers; a complete list, together with a description of their contents, can be found here. You can choose *almost* any of them: 101-122, 125, 127-129, and 137-139.; see also the remarks under Choosing your options in Part B below.

Choosing your options in Part B

Physics: Your Physics subjects in Part B must include at least two of the three subjects B2 *Symmetry and relativity*, B5 *Cosmology and General Relativity* and B7 *Classical Mechanics*. As far as the regulations are concerned that is the only requirement. The following considerations might influence your choice, but note that your choice is fairly restricted and you may find that you can't follow all the advice!

B5 *Cosmology and General Relativity* is to some extent dependent on B2 *Symmetry and relativity*, since the latter includes a much more detailed study of Special Relativity than the the the CP1 paper in Prelims, so if you want to study General Relativity you will probably save yourself some extra work if you take subject B2 as well. In making your choices in Part B you should bear in mind your likely choice of Physics Major Option (if any) in Part C, as some of them depend on specific material in the Part B papers. The following are the normal pre-requisites for the Major Options:

Option	Essential	Also Used (can be learned in vac)
C1(Astrophysics)	B2, B3, B5	B1 (convection) B4 (solar fusion)
C2(Laser Science/Quantum Info.)	B3(lasers)	B3 (atomic), B2 (optics)
C3(Condensed Matter)	B6	A2 (macroscopic electromagnetism)
C4(Particle Physics)	B2, B4	B3 (density matrix, shell structure, selection rules)
C5(Atmospheres and Oceans)	B1	
C6(Theoretical Physics)	B2	B4 (scattering theory), B7 (Lagrangians)
C7(Biological Physics)	B1	

But note again that even the column headed Essential is only advisory — there is no regulation enforcing this pre-requisite. If you are willing to put in the extra work, probably in the long vac, you may be able to do the option of your choice without following the advice given here.

Philosophy If you decide to do a fourth philosophy subject in Part B, your choice of subject should if at all possible be made at the end of your second year, so that you can do some reading for it over the long vacation. You should make sure that you discuss it with your tutor by the end of the second year, as they will need to organise the teaching for it.

Teaching

Each of the Physics subjects B1–B6 has a course of 22 lectures and five tutorials. Subjects B1–B3 will be taught in Michaelmas Term, and B4–B6 will be taught in Hilary Term. There will be a small number of revision tutorials in Trinity Term.

The syllabus and lecture course for subject B7 *Classical Mechanics* overlaps with the Physics Short Option S7 of the same name, but in each case yours is longer: a longer syllabus and a 16-lecture course, in Hilary Term. For this reason, and in view of the significantly greater weight attached to performance in this paper for

PP students as compared with physics students taking S7, you should have tutorials for this paper. Since no tutorial provision is normally made for short options your College tutor may not be able to arrange these tutorials for you within your college, in which case you should contact the Chair of the Joint Standing Committee for P&P, who can recommend a tutor to your College.

If you want to offer one or more Physics Major Options in Part C (see the next section) please note that there will be a general introduction to the Major Options in the sixth week of Trinity Term of your third year (for details please consult the Physics Lecture List.) By Friday of sixth week (TT) you will be required to return a form indicating your option choices in order of preference. The information is not binding, but is needed by the physics department to make arrangements for the option class teaching.

Teaching for Philosophy options has the same format as for the second year; typically, you will do philosophy of science, philosophy of quantum mechanics, and (if appropriate) your elective option in the third year. Revision classes may be provided for philosophy subjects in Hilary and/or Trinity term of your third year, either in your own college or across all colleges; naturally you should attend these.

Third year sample timetable

3rd year philosophy

MT	Lectures	Intermediate Philosophy of Physics (Quantum Mechanics); Philosophy of Science; Philosophy elective (if taken)
	Tutorials	Philosophy of Science Option (8); Philosophy elective (if taken) (4)
HT	Lectures	Philosophy of Science Option; Philosophy elective (if taken).
	Tutorials	Intermediate Philosophy of Physics (QM) (4); Philosophy elective (if taken) (4)
TT	Revision	

3rd year physics

MT	Lectures	Physics Options/electives, subjectsB1 – B3
	Tutorials	(5 tutes/classes per physics subject)
HT	Lectures	Physics Options/electives, subjects B4 – B7
	Tutorials	(5 tutes/classes per physics subject)
TT	Revision	

Your college tutors may vary your timetable; if they do, make sure you understand what the overall structure of the year is at your college.

7 The Fourth Year: Part C

Syllabus and Examinations

The fourth year comprises Part C of the FHS of the PP degree. The examination is in the latter part of Trinity Term in both disciplines.

Candidates will be required to offer three units in Physics or Philosophy, in any combination — all Physics, all Philosophy, or a mixture. (As usual the fomal requirements are given in the Exam Regulations.) The list of units is as follows:

Physics

1. One of the seven Part C physics options — Astrophysics, Laser Science and Quantum Information Processing, Condensed Matter Physics, Particle Physics, Physics of Atmospheres and Oceans, Theoretical Physics, and Biological Physics. Details of these options can be found in the Physics handbook.

2. A physics project, like the one that all Part C physicists do. The rules for choosing a project are given in the Physics Handbook; note that you must specify your choice of project by noon on Friday of the second week of Michaelmas Term of your fourth year.

Philosophy

- One of the Philosophy papers 101-116,122, 125,127-129,137-139 - as listed here and which you have not already taken in part B. Many of these are the same papers that you could have chosen for the Part B elective, but the examination process is slightly different — see below. As for Part B, you can choose *almost* any option, though there are some minor restrictions.

- The Advanced Philosophy of Physics paper. As the name suggests, this is effectively a continuation of the Part B Intermediate Philosophy of Physics, building on it in breadth as well as depth. Topics in space-time physics and quantum mechanics are pursued with a new focus on some central questions in metaphysics, philosophical logic, and philosophy of probability. In addition this is your first opportunity to study foundational questions in thermodynamics and in statistical mechanics.The subject is unusual in that much of the literature that you will be studying is recent and that you will be considering at least some topics at the forefront of research in the discipline. It is also unusual in terms of its examination and teaching (see below).

- A 20,000 word Philosophy thesis. See below for advice on choosing and writing a thesis. If you want to undertake a research project which draws significantly on both the physics and philosophy halves of the course then there is a choice between treating it as an MPhys project (for which you are allowed to propose your own topic if you can find a superviser) or a philosophy thesis. If the examination of the topic will require input from both physicist and philosopher then it is best handled as a philosophy thesis, as there is more flexibility in the supervision and examination arrangements, and the length is significantly greater.

For details of the examination process for physics options, see the Physics course handbook. All the philosophy options (except for Advanced Philosophy of Physics and the thesis) are examined by a three-hour written examination, and, in addition, an essay of at most 5000 words in that subject, to be handed in not later than noon on Friday of the first week of Trinity Term, which will also contribute towards your examination result. This essay is discussed further below.

For Advanced Philosophy of Physics, you are examined by two 5,000 word essays, each on a topic of your choice within the syllabus of the subject. (The formal regulations governing the writing, submission and examination of such essays are set out in the P&P Exam Regulations.) You need to submit such topics for approval by Friday of 6th week of Hilary Term. Prior to that date, you will receive from the Director of Undergraduate Studies a list of approved questions; if you wish to use one (or two) of them, there is no requirement to seek approval for it (them). There is no obligation to use these questions, but they can act as a backup in the unlikely event that you propose a question that is not deemed acceptable.

Teaching

Part C physics options are normally taught in departmental classes; see the Physics course handbook for details. Part C philosophy options (except for Advanced Philosophy of Physics) are taught as for part B, i.e. by lectures and tutorials. Again, you should expect to have eight tutorials on each philosophy paper; one of these tutorials will normally be used for feedback on a draft of your extended essay. For Advanced Philosophy of Physics, teaching consists of sixteen classes (eight in each of Michaelmas and Hilary Terms) in which student participation is encouraged, as well as tutorials. You should expect six standard tutorials plus one feedback tutorial for each of the two essays (see above) in draft form.

Research

By your fourth year you count as a Masters-level student, and should think of yourself that way. If you haven't already, you should start attending some of the University's many research lectures and seminars.

The research communities in physics and in philosophy at Oxford are among the largest and most active in the UK. For more information on them, visit their respective web-sites; keep an eye out for fliers for coming conferences and talks by physicists and philosophers. You will find, particularly in your final year, that you will be able to follow most of those intended for a general audience; you will be able to get a good sense of the excitement and pace of research in these two disciplines.

In particular, the local community in philosophy of physics meets once a week in term time for the philosophy of physics research seminar. It is held on Thursdays at 4.30 pm, normally in the Lecture Room of the Philosophy Centre. Seminars are usually presented by visitors from abroad, who are staying at Oxford, or by researchers in the field in the UK, who have travelled to Oxford especially for the occasion. Presentations usually run for about an hour, followed by about an hour of discussion. In your first two or three years of the FHS you will find them a stretch, but in your final year you should do your best to attend at least some of them, particularly if you are interested in research. Check the Philosophy website

for up-to-date details and venue.

Philosophy extended essays

Each essay must be your own work, though it should show knowledge of relevant literature in the subject and may include passages of quotation or paraphrase so long as these passages are clearly indicated as such and the source properly attributed. You may discuss a first draft of the essay with your tutor for that subject. The amount of assistance the tutor may give shall be limited to what can be provided in one of your tutorials for that subject. Note that you must avoid any substantial repetition of material presented in your essay with material presented in your three-hour written examination. In your fourth year, therefore, you will have to show rather more initiative in the study of your elected subjects than for subjects taken for examination in Part B of the FHS, consonant with doing work of Masters level.

The formal regulations governing the writing, submission and examination of such essays, as well as those for the thesis option, are set out in the *Examination Regulations*. For each unit, an essay topic may be chosen from any one of the questions set for the previous year's Second Public Examination (i.e., Finals) paper on the subject in question, with the following exceptions:

1. Commentary questions from papers centred around study of texts, for example the papers in ancient philosophy.

2. A list of essay topics for Philosophical Logic is available on Canvas.

Most philosophy students at Oxford don't have to do these essays (they are only for 4th year options, i.e. only for Physics & Philosophy and Maths & Philosophy students), so make sure your tutor knows about it at the start of your tutorials.

The Philosophy Thesis

You must seek approval of the topic of your proposed thesis by the Friday of the fourth week of Michaelmas Term preceding the examination. The right time to seek approval is earlier, however, before you start to work on it in earnest. Begin thinking about it *in the Easter vacation of your third year;* talk to one of your tutors about it in the following Trinity Term. If your tutor thinks that the subject is manageable, get some initial suggestions for reading; follow them up in depth over the Long Vacation. Bear in mind that much of your reading will be discovered by yourself; so arrange to be in Oxford, or near a large library, for some weeks of the vacation.

Remember that tutors can only advise: the decision to offer a thesis is your own, and so is the choice of topic. So of course is the work; what makes a thesis particularly worthwhile is that it is your own independent production. The regulations state that you may discuss with your tutor "the field of study, the sources available, and the method of presentation". The plan must be yours, but the tutor can help you make sure it is clear, coherent and feasible.

If you decide to go ahead, submit your title and 100-word outline to Director of Undergraduate Studies, c/o the Undergraduate Studies Administrator, Faculty of Philosophy, in accordance with the regulations for theses, as early as possible. You needn't worry if in the event you do not adhere to your outline: the point of it is

to make clear the general subject of the thesis and to show that you have some idea how to tackle it.

Don't let your topic expand, or your reading range too widely; 20,000 words is the length of two or three articles, not a book. Do not try to cover too much material, for this is likely to result in a thesis that is superficial. The examiners will be more interested in your attempt to develop your own line of argument, in some detail, and much less interested in your account of what others have said on the topic. Your tutor may read and comment on your writing, consistent with the amount of tutorial time available to you — the same as for the teaching of a normal paper in philosophy — so tutorial sessions can be used for trying out first drafts of parts of the thesis; however, you have to write the finished version on your own. Make sure you allow plenty of time — almost certainly, more will be needed than you first expected. You must not exceed the word limit, excluding quotations and bibliography. That will probably, to your surprise, become a problem; but the exercise of pruning is a valuable one, and you will find it encourages clarity and precision that you should be aiming for in any case.

Some further advice: (i) the examiners cannot read your mind; explain in your introduction just what you are going to do, and in what follows present the argument, step by step, in as sharp a focus as you can achieve; (ii) break your argument into suitable chapters or sections, and provide a helpful table of contents; (iii) notes and references should be given at the bottom of each page, but don't let notes like this proliferate: usually a point is either important enough to be included in the main text, or not important enough to be included at all; remember that footnotes are included in the word count; (iv) include a bibliography at the end, listing all the works to which you refer, plus any others you have used that are relevant to the final version; the style for references can be modelled on any recent philosophy book or periodical; (iv) bad spelling and bad grammar do not help to convey an overall impression of clarity and competence; (v) examiners will notice if you try to fudge issues or sweep difficulties aside; it's much better to be candid about them, and to show that you appreciate the force of counter-arguments.

The rules for format and submission, and for any change of title, are in the Grey Book. You should take the deadline for thesis submission *very seriously.* If for any reason you expect to submit your thesis late, consult your Senior Tutor in good time. The Proctors may grant permission for you to do so, but there will generally be a financial penalty, and they may at the same time give permission to the examiners to reduce the mark on the thesis by up to one class. If permission is not sought, or is refused, the thesis may be rejected, or its mark may be reduced by up to one class.

8 If things go wrong

Illness

If illness interferes seriously with your academic work, make sure that your tutors know the fact. If at all possible choose a tutor at your college in whom to confide — otherwise it will be difficult for the college to help. Help may involve: excusing you tutorials for a bit; sending you home; asking the University to grant you dispensation from that term's residence (to qualify for your degree you must reside and study in Oxford for nine terms — or six if you have Senior Status — and a term for that purpose means forty-two nights); or permitting you to go out of residence for a number of terms, with consequent negotiations with your funding body.

If illness has interfered with preparation for a University examination, or has affected you during the exam itself, your college must report the fact to the Vice-Chancellor and Proctors, who will pass the information to your examiners 'if, in their opinion, it is likely to assist the examiners in the performance of their duties.' Your college also reports to the Proctors if illness or disability has prevented you from attending part of a University examination, or makes it desirable that you should be examined in a special place or at a special time. The college officer concerned is the Senior Tutor. You, therefore, must deal with your Senior Tutor, never with the examiners. Give the Senior Tutor as much notice as possible; in particular, examinations specially invigilated in a special place (usually your college) take a lot of organising, and the deadline for getting permission in respect of foreseeable problems such as dyslexia is Second Week of the term of the examination. Probably you will need a medical certificate; college doctors have the right University forms.

Problems with your tutor

If you are unhappy with one of your tutors for any reason and don't feel comfortable talking to them personally about it, there will certainly be people to talk to at your college about it. Most colleges assign each student a "personal tutor" or "moral tutor" or "college advisor" who is supposed to keep an eye on your overall progress at Oxford, and may be a good person to talk to; it might well be useful to talk to one of your other tutors, or to one of the student advisors. Your college will probably tell you more about its internal procedures. Ultimately, it is the job of the Senior Tutor at the College — and, behind them, the head of the College — to ensure that all students have satisfactory teaching, and so eventually any serious complaint should come to them. Almost certainly this won't be necessary: most students in Oxford are very happy about their teaching. (Note that it is the College, not the Philosophy Faculty or the Physics Department, that is ultimately responsible for tutors; any concerns with your tutors need to be pursued on the College, not the University, side.)

If you would like a change of tutor, say so if it is not embarrassing; otherwise don't just do nothing, but again take the problem to someone else in your college, if your difficulty is serious. Most such problems arise from a personality-clash that has proved intractable; but since in a university of Oxford's size there are almost certain to be alternative tutors for all your subjects, there's no point in putting up with a relationship that is impeding your academic progress. In these circumstances you can usually expect a change, but not necessarily to the particular tutor whom

you would prefer.

Changing your Course

Don't think of changing course at the first sign of difficulty. All courses that are worth anything bring the student up against obstacles, and your tutors will guide you past them. Seek the advice of your tutors at all times when in difficulty. Discuss problems also with your contemporaries; you are not in competition with them, and you should get into the habit of helping and being helped.

If you decide you really do want to change, there are three bodies which must approve: the University, your college, and those who are paying for you.

The University is unlikely to be an obstacle. There are no restrictions on examination entry: provided that your college approves, you may be a candidate in any part of the First Public Examination; and the condition for entering for a Final Honour School, besides college approval, is that (if not exempt) you should have passed some part of the First Public Examination — any complete Mods or Prelims will do. However, a few departments, such as Psychology, do have quotas for acceptance on to their courses.

It is your college that has admitted you to read for a particular Honour School, or a particular combination of First Public Examination plus Honour School. You cannot change without its permission, which is liable to be refused if the 'receiving' tutors think you unsuited to their course, or don't have room (in some courses the teaching resources are often very strained). If you wish to explore the possibility of changing, the first rule is, 'Don't delay' — you could be losing vital learning time. Talk to your current tutors or, if that is embarrassing, to your College Adviser or the Senior Tutor or some other tutor whom you know.

If you hold an award from your Local Education Authority, even if it's fees-only, you will need the authority's permission to change course. Your college's Senior Tutor will do the correspondence. Other awards, scholarships, sponsorship, etc. may be tied to a particular course. Again the Senior Tutor will help, once your college has agreed to let you change.

Sometimes a change of course involves a fresh start, delaying Finals by a year. Local Education Authorities are required to fund the extra time, on condition that the new course is no longer than the abandoned one, and that you have been accepted on to it within sixteen months of starting, which is deemed to mean by the end of December of your second year. This rule applies even if the new course is at a different UK university. But remember that acceptance on to a course may take several months, and you cannot plead that you failed to foresee the due formalities.

You won your place at Oxford University, and with your college, as a candidate for the 4-year degree, but you have the option of leaving the degree course at the end of your third year (or at any point in your fourth year). In such a case you may only supplicate for the BA degree. This does not constitute a change of course: you will simply be electing to terminate your course early.

Welfare

While we hope that your time at Oxford is happy, University life can be stressful and it is important to remember that there are many sources of help available if things

start getting too much. Some of the most useful include:

- Your college tutors. As well as your subject tutors, most colleges will allocate you a "personal tutor" (who may or may not also be a subject tutor), who should be happy to advise you about any issues you are having with your time in Oxford.

- Your college's Chaplain and other official welfare officers. Slightly confusingly, the chaplain of an Oxford college normally has a welfare role which is not connected to his or her chapel responsibilities. Many colleges also have other staff members who can help, such as college nurses or Fellows with an official welfare responsibility.

- Your JCR Welfare officers. The JCR (or Junior Common Room) is the assembly of all undergraduates at the college (in one or two colleges it is called a SU, or Student Union). All JCRs elect one or two Welfare officers, who will usually be second or third year students who will be happy to help, advise or listen. Other JCR officers, such as the Womens' Officer, may also be helpful.

- Nightline. This is a confidential, anonymous listening service run by and for Oxford students, and open 8pm-8am in termtime. You can phone them (01865 270270, or just 70270 on a university phone) or visit their offices at 16, Wellington Square. For more information see:

  users.ox.ac.uk/ nightln.

- The University Counselling Service. The University has a professionally staffed confidential Student Counselling Service for assistance with personal, emotional, social and academic problems. The Service is available free to all matriculated undergraduate and graduate members of the University, and contact details may be found at

  https://www.ox.ac.uk/students/welfare/counselling?wssl=1.