SCHOOL OF PHYSICS AND ASTRONOMY
HONOURS HANDBOOK – 2016-17

CONTENTS **Page**

Introduction	3
Aims of our Teaching Programmes	4
Honours Entry Requirements	5
Bachelor's and Master's degrees	6
QAA and SCQF Requirements	6
Coordinators/Advisers	6
Selection of Modules	7
Preparation	8
Tutorials	8
Transferable Skills	9
Practical Work	9
Projects	10
Student Work	12
Monitoring and Assessment	13
Academic Alerts	14
Penalties for late submission and Word/Space Limit Issues	15
Absence from Classes, Tests, or Examinations	16
Special Circumstances Affecting Assessment	16
Good Academic Practice, and Academic Misconduct	17
Use of Calculators in Examinations	18
The 0-20 Grading Scale	18
Progression	21
Deans' List	22
Medals and Prizes	22
Feedback on Assessed Work, & Access to Examination Scripts	23

Appeals and Complaints 23
Ethics (UTREC) 24
Diversity, Respect, Community 24
Information for students 24
English Language Support 25
Disabilities Coordinator 25
Work Spaces 26
J F Allen Library 26
Computing Facilities 27
Student-Staff Council and School President 27
Research Colloquia 28
Advanced Topics in Modern Physics 28
SUPA Lectures 28
CAPOD Resources 28
Programme-specific fees 29
Careers and Research 29
Finding Referees 31
Health and Safety 31
Advice and Support 31
Academic Session 32
Appendix 1 - Key Contacts/Coordinators 33
Appendix 2 – Some Staff Members 34
Appendix 3 - Modules in 2015-16 35
Appendix 4 –Honours Programme 37

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Introduction

This handbook provides information about honours degree programmes offered by the School of Physics and Astronomy. These programmes are for students in years 3 (Junior Honours), 4 (Senior Honours) and 5 (MPhys final year) of an honours degree and comprise the following:

(a) the honours BSc degrees in
Astrophysics
Physics

(b) the joint honours BSc degrees in Physics and one of
Computer Science
Philosophy (formerly Logic & Philosophy of Science)
Mathematics

(d) the honours MPhys degrees in
Astrophysics
Physics
Theoretical Physics

(e) the joint honours MPhys degree in Theoretical Physics and Mathematics

(f) the joint honours MSci degree in Physics and Chemistry

A separate handbook entitled "First and Second Level Modules" provides full information about the modules in Physics and Astronomy for pre-honours students. Both handbooks are available online and in paper versions.

We hope that the information in this handbook will be useful to our students. Honours students are expected to have read and understood what is in this document. If there are any discrepancies between this document and those published by the Centre of the University, the latter takes precedence. Please ask staff if you have any queries. I am happy to meet with our students to discuss any aspects of their study here.

Bruce Sinclair, Director of Teaching for the School of Physics and Astronomy
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Aims of our Teaching Programmes

- To provide a systematic functional knowledge and understanding of core physical concepts, principles and theories, and some of their applications.
- To provide specialist functional knowledge and understanding relevant to the particular degree programme, for example in astrophysics, theoretical physics, or photonics.
- To provide access to physics at the frontiers, capitalising on the strengths of the research undertaken in the School.
- To develop proficiency in the analysis of complex physical problems and the use of mathematical and other appropriate techniques to solve them.
- To develop the ability of students to organise their knowledge in a way that they can articulate the big ideas from the various modules, and can see the inter-relationship of material from different modules. Students should develop the ability to filter their knowledge in such a way that they can access the information that they need to apply to a particular problem or learning situation.
- To provide the ability to plan, execute under supervision, analyse and report upon the results of an experiment or investigation.
- To provide experience and expertise in experimental investigations for all students at the earlier stages of the programme. At least for students on the *Physics* degree programme to develop these skills further in the honours years. At least for students on the *Astrophysics* degree programmes to develop competence in observational and computational techniques in astronomy. At least for *Physics* students to develop skills in the use of computers for control, data acquisition, and data analysis in experimental investigations.
- To develop the professional skills of teamwork, independent learning, information retrieval, critical analysis, and the communication of scientific concepts in writing and orally.
- To develop the ability to be a self-directed learner, including fostering a healthy intellectual curiosity in this and other disciplines, and the ability to determine one's own learning needs and to organise one's own learning.
- To enthuse students about the discipline and its applications, and to develop their confidence in their work using the discipline.
- To provide students in the School with an educational and social environment which encourages them to become informed, responsible, and respected members of society.
- To provide opportunities and support for all students to reach their full potential during their studies.

Honours Entry Requirements

Students entering honours are expected to have 240 pre-honours credits (for accelerated-entry students 120 of these may be "advanced standing" credits").

Honours entry based on first assessment in modules - For entry based on first sitting of module exams the requirements are as follows:-

BSc Honours Programmes

Passes at mean grade 11 or better in PH2011 and PH2012;
Passes at mean grade 11 or better in MT2501 and MT2503

For the BSc in Astrophysics, also grade 11or better in AS2001 or AS2101
For the joint degree programmes, the requirements of the other School.

MPhys and MSci Programmes

Passes at mean grade 15 or better in PH2011 and PH201;
Passes at mean grade 15 or better in MT2501 and MT2503

For the MPhys in Astrophysics, the first requirement above is changed to passes with mean grade 15 or better in PH2011, PH2012 and [AS2001 or AS2101].
For the joint degree programmes, the requirements of the other School.

Qualified honours entry (based on resit or honours entry exams late summer)
For qualified entry those who are eligible for reassessment with a grade in the required module(s) between 4.0 and 10.9 may take the module exam(s) in the late summer diet. If they then satisfy the University requirements (broadly - achieve a grade of 13.5 or more in each) then they may have qualified entry to BSc honours. Subsequent progression thresholds are the same as for automatic entry to honours.

There is no qualified entry to the MPhys honours programme, but those in the BSc honours cohort who achieve particularly well in JH may be permitted to move to the MPhys cohort (see later in this handbook).

Please see the University regulations at
http://www.st-andrews.ac.uk/media/teaching-and-learning/policies/honsentry.pdf

Bachelor's and Master's degrees

.

The range of honours degrees available here is:

BSc degrees	4 years duration†, modules normally adding up to 120 credits per year, total 480 credits.
MPhys and MSci degrees	5 years duration†, normally adding up to 120 credits per year, total 600 credits.

In all cases, our Master's degrees are distinguished from Bachelor's degrees by the following:

- Master's degree programmes involve a greater number of credits, amounting in the MPhys and MSci to one year's extra study for the same entry points.
- The final year project for a Master's degree is more ambitious and/or research orientated than that for a Bachelor's degree.
- Master's degree programmes involve modules at 5000 level which are more specialised and advanced.

Since Master's degree programmes are more demanding than those leading to a Bachelor's degree, a particularly good performance at second level is required.

QAA and SCQF Requirements

Honours modules classified as 3000, 4000 or 5000 level correspond with SCQF levels of 9, 10, and 11 respectively. Modules are allocated credits, where each credit point should correspond to 10 hours of work for the average student at that level. Level five modules are regarded as being appropriate for both postgraduate MSc students and students in the final year of an integrated masters programme.
www.scqf.org.uk/content/files/SCQF_handbook_FULL_-_amended_Dec_09.pdf.

Coordinators/Advisers

The members of staff (listed in Appendix 1) who have responsibilities for co-ordinating the organisation of the Honours Programme for Junior Honours, Senior Honours and year 5 students are also the Advisers of Study for those year groups.

They are available to be consulted on any academic queries which may arise during the year, and they provide advice at the start of each session on selection of modules

† One year less for students who choose Direct Entry to second level physics.

etc. Any subsequent changes in module registration can only be done in consultation with your advisor and need to be completed within the first week from the start of term. Any changes thereafter would also need the permission of the pro-Dean.

Should you wish to see your adviser and they are not available, the School's Director of Teaching may be able to assist with some queries.

Selection of Modules

All honours teaching is expressed in terms of modules, and the differences between degree programmes are expressed in terms of the different combinations of modules which are to be taken, or from which a certain selection must be made.

Appendices later in this handbook list the modules which will be available and show the selection of those that provides the recognised programme for each of the degrees. In addition to the compulsory modules listed, students normally have a free choice from the remaining modules, subject to satisfying the prerequisites which are given for each module and also to timetable restrictions. Some modules from the School of Mathematics may also be of interest. It should be noted that 5000 level modules are normally available only to MPhys and MSci students in their final year of study.

Detailed synopses of the honours modules to be given, together with teaching aims and prerequisites for each module, are available on the School's website, via the "Modules" link on the Students and Staff page. The prerequisites listed are intended to be a helpful guide to the previous knowledge which is normally required by a student starting a module. They are not meant to be interpreted in a completely rigid manner however and there may well be students who are able to tackle a module successfully without actually possessing the qualifications listed. The co-ordinators will be able to advise on such matters.

We publish advice on module choices in the "Pre-Advising and Advising" section of the School's Students and Staff web page. Students are asked to note that if they choose modules that do not have exams, they may need to work more hours per week on those modules during the non-exam part of the semester than on modules where work is also expected in the revision and exam weeks. This should be a consideration if choosing multiple such modules in the first semester of year five.

The University permits students on an honours programme to take a small number of credits from pre-honours modules during their honours years. This is known as "dipping down". The School recommends that our honours students "dip down" only where necessary for interest or need. The School does not normally permit honours students to "dip down" in their final semester of study.

Students are normally expected to take most of their "choice" honours modules from AS and PH modules (and that of their joint degree other subject where appropriate). For a single honours BSc degree student we normally expect at least 210 honours credits during the honours programme from AS and PH and programme-specified MT modules. Relevant MT honours modules are also likely to be approved by a student's adviser of studies. The same is the case for a student in the first two years of an MPhys programme.

The University's Module Catalogue, Student Handbook, and other publications state the rules associated with an academic programme. However, we anticipate that this honours handbook, our associated module synopses, and the pre-advising advice documents on the School's staff and students webpage will be at least as useful an information source for our students.

Preparation

Students are encouraged to use part of the summer to revise and practice their work from the previous year. The University now regards Orientation week as a time for returning students to prepare for their new studies, and the Thursday and Friday as normal teaching days. The School has a number of resources to help students in this work. All students entering JH are asked to work on mathematics revision sheets, and all those planning to take Special Relativity and Fields or General Relativity modules are asked to study some teaching videos (vodcasts) on tensor notation.

Tutorials

Students in the JH year benefit from small group tutorials, which are compulsory. In semester one there is a weekly tutorial in a group of around eight students covering Maths for Physicists and Quantum Mechanics 1 (the topic alternates week to week). In semester two tutorial groups of about eight students cover Quantum Mechanics 2 and Thermal and Statistical Physics, and smaller groups of about 5 students cover Electromagnetism. Solid State Physics is taken by most students in Senior Honours, and has associated with it small group tutorials. A list showing the groups and tutors will be published shortly after the start of semester.

For other honours lecture modules, the tutorial arrangements are different. The lecture timetable for each module will include slots intended to be used for whole-class tutorial purposes, at the rate of at least one every three weeks. These tutorials will be taken by the lecturers concerned.

Transferable/Professional Skills

It is increasingly acknowledged that the acquisition of transferable or "professional" skills should be an important goal for students in higher education. Such skills include the ability to apply existing knowledge to solve new problems; expertise in finding information and evaluating it; the ability to communicate effectively orally and in writing; the ability to work in a team and demonstrate leadership; organization of one's own work, resilience, creativity, recognising skill needs and achievements, making and taking opportunities, and the assumption of responsibility for one's own learning. Many of these skills are developed in the normal course of honours study.

The module PH3014 Transferable Skills for Physicists, which is usually spread over the JH year, is designed to expose students to a wide range of activities which will help develop their transferable skills to an advanced level, while at the same time exploring aspects of physics and astronomy of interest to them. These activities include the writing of a review article, and practice in giving a talk on a chosen topic in physics or astronomy. The latter is done in the context of a student conference, usually held at the Burn, Edzell. More details are given in the description of the module on the School's website. PH3014 is a compulsory part of the teaching programme for all single honours students in their JH year. Much of the first semester of study in PH3014 forms part of PH4040 Nuclear and Particle Physics with Advanced Skills, which is a compulsory module for many of our joint degree students. Chemistry and Physics students have some of this in PH4043 Studies in Physics and Chemistry.

Practical Work

Physics

The aims of laboratory work at honours level are:

- to familiarise students with a wide range of experimental techniques and equipment.
- to strengthen understanding of important physical concepts
- to develop sound practice in planning of experiments, risk assessment, record keeping, data handling and evaluation, error analysis, drawing evidence-based conclusions, and identifying future work.

Each lab module is divided into five sub-modules; these consist of experiments and demonstrations illustrating a particular aspect of experimental physics. The laboratory afternoons are on Monday and Thursday. The assessment mechanism can vary between sub-modules, but will be drawn from material in the lab notebook, written reports on the demonstrations and on the experiments, presentations, and short tests.

Details are given in the lab handbook. One of the lab modules will also include an assessed formal report.

Astrophysics

The aims of the astrophysics "laboratory" modules are to equip students with skills in the field of observation, measurement, data analysis, computer programming and modelling, and report writing. All students take AS3013 Computational Astrophysics in the second semester of JH, and may take AS4025 Observational Astrophysics in the first semester of SH. Essential supervision and assistance are provided, but students are encouraged to work independently. Monday and Thursday afternoons are reserved for practical work, and students undertake additional evening or night work when required for observation.

Theoretical Physics

Students on the theoretical physics programmes are not required to take laboratory modules, but, subject to the permission of their adviser may do so if they wish.

Projects

All honours students in the School undertake individually a project in their final year, though the arrangements vary according to the degree programme taken. The information below is associated primarily with AS and PH projects; in some cases joint-degree students will take a project or similar module in their other School.

A list of possible projects available in this School, giving details of references and suggested programmes, is provided near the start of the session. Each project, which may combine the elements of a review, research, and development in varying proportions, is carried out under the supervision of a member of academic staff and leads to the presentation of a written report. As part of the assessment of the project, each student is required to give a brief presentation on the results of the project and to answer questions put by members of staff.

Although all projects are two-semesters long, most of the work is normally carried out in semester two. A short pre-project report is required from all project students early in the process, and this can serve as a useful background for planning the research. The final project reports are due in towards the end of semester two, as detailed in the separate project documentation. Most MPhys students have the project as their only module in semester two, allowing a complete immersion in the research experience.

On a number of occasions a project has led to the publication of a paper in a research journal, providing an especially valuable point for inclusion in references for scholarships and employment. The School offers prizes for the best projects.

It is a University requirement that any Honours or Masters dissertation that required ethical approval from the University's UTREC committee, should have the letter or email of ethical approval bound into an appendix before submission. There is more on this later in this handbook and at http://www.st-andrews.ac.uk/utrec/

Projects in Physics

Usually the project entails an original investigation of some phenomenon, often undertaken in one of the research laboratories and sometimes involving collaboration with industrial firms. Project PH4111 is for BSc students and is worth 30 credits, while Project PH5101 is for MPhys and MSci students and is worth 60 credits.

Projects in Astrophysics

All final year students undertake a project, selected from a list of topics suggested by supervising staff, but suggestions from students themselves are welcomed. Project AS4103 is for BSc students in Astrophysics and is worth 30 credits, while Project AS5101 is for MPhys students in Astrophysics and is worth 60 credits.

Projects in Theoretical Physics

A project in theoretical physics (PH5103) is compulsory for single-honours Theoretical Physics (MPhys) students.

Projects in the Chemistry and Physics MSci degree

Students may choose to do their project primarily in Chemistry or primarily in Physics. For this degree it may be necessary to spread the project work more evenly through the year.

Projects in the Mathematics joint degrees

Students on the BSc Mathematics and Physics programme and on the MPhys Mathematics and Theoretical Physics programme have a choice of doing their project in either Mathematics or in Physics. These students are encouraged to speak with relevant staff in both schools about this choice. This is particularly important as the two schools release project topics at different times. Staff in our School find that their research work over the summer can often generate interesting project topics to suggest for the coming session.

Projects in the joint degrees with Computing and with Philosophy

These students need to choose between a project module in physics or in their other subject. If they choose the physics project it will run as detailed above for physics.

Student Work

In addition to their attendance at lectures, tutorials and (where applicable) laboratories during normal class hours, students are expected, through independent study, to work at augmenting their knowledge and understanding of the topics being taught in their modules. Each unit of credit should correspond to 10 hours of study time in total, for the average student at that level. For a conventional 120-credit a year programme this corresponds to a study-time commitment (including scheduled classes) of around 40 hours per week.

Forty hours a week of study should allow time for students to engage in other activities. While we realise that some students will wish or need to take paid employment, we suggest that during semester time this should not be so many hours that it impacts significantly on your abilities to study.

If you encounter difficulties in understanding the lecture material which cannot easily be resolved, eg by reference to text books or discussion with classmates, you are encouraged to approach your tutor or the lecturer concerned who will be pleased to deal with queries of this type.

As one of the aims of our teaching programme is

> *To develop the ability to be a self-directed learner, including fostering a healthy intellectual curiosity in this and other disciplines, and the ability to determine one's own learning needs and to organise one's own learning.*

students are expected and encouraged to use information in the library and online to help their studies, as well as discussing physics with other students and with staff.

The School encourages students to form groups that can meet on a regular basis to discuss the work being covered in the teaching programme. The Group Study Area in the School is one place that may be used for such meetings.

Monitoring and Assessment

For each lecture module students will normally be issued with questions and/or problems, and asked to work to provide solutions by specified dates. These solutions should be assessed to provide students with feedback. Students will be told in advance whether or not the work contribute to the overall grade for the module. However, it is the practice of the science and techniques concerned that is of prime importance to a student.

Most lecture modules involve an examination, consisting of one paper of two hours, held at the end of the semester. From the 2016-17 session all the School's exam papers may have no choice in the questions.

At honours level it is expected that some of the material in the questions will cover concepts or reasoning that requires a student to think and reason beyond the material covered already in the module. Students should note that exams may be close together, and so should work to be on top of the entire semester's material well before the examination weeks start. This is also good study practice – you want this material and its understanding to "stick" for future work, and not just be a cram for exam and then forget. Although we run degree programmes that are assessed module by module, the knowledge and skills developed in one module is often needed in subsequent modules.

The School's Students and Staff web page links to some past examination papers and sample solutions, along with guidance on the way that examination questions are structured and what they are aiming to assess. The University's iSaint portal gives access to the last few years of exam papers.

Students whose first language is not English may request access to an English-foreign language dictionary, provided by themselves, during examinations. Such students should contact the School's Examinations Officer who will provide a certificate to show to the examination invigilator.

Please note that, unlike pre-honours modules, there are no conventional resit examinations in honours modules. The grade obtained in an honours module (possibly including also at oral re-assessment, see below) will appear on a student's transcript and will form part of their degree classification calculation.

Honours students who fail a module (grade less than 7.0) which involves an examination, and who have achieved at least grade 4.0 in the examination, will be eligible for a re-assessment. As soon as possible after the original assessment, they will be invited to attend the reassessment, which may take place within days of the announcement. The reassessment will take the form of an oral examination where two examiners seek to determine if the student has sufficient command of the material to

be eligible for a grade 7 pass. The oral examination is normally be conducted by a lecturer who taught on the module together with a member of staff nominated by the Year Coordinator. The oral examination will normally be held in the J F Allen building, and may not be done by Skype or similar process. The reported grade for the re-assessed module cannot be any higher than 7.0. Students who do not achieve grade 4.0 in an examination, or who achieve less than grade 7.0 in a module which is entirely continuously assessed, are not eligible for re-assessment or academic credit for that level 3, 4, or 5 module at that sitting, which can have significant impact on a student's degree programme.

Academic Alerts

Academic Alerts are a way of helping students who are having trouble coping with their studies; such as missing deadlines for handing in work, or missing compulsory tutorials. The aim of the Alert system is to help students by flagging up problems before they seriously affect students' grades. Academic Alerts will be issued by email from the Director of Teaching, Director of Postgraduate Studies, Module Coordinator or School administrator and will tell students what is wrong and what they are required to do (e.g. attend classes in future). The Alerts will also tell students what support the University can offer. If students do not take the action required they may get another Alert, and eventually may automatically get a grade of zero and will fail that module. The system is designed to help and support students in order to remedy any problems or issues before these lead to failing a module. Alerts will never appear on a student's permanent transcript. For more information on Academic Alerts and details on how the categories work, see
https://www.st-andrews.ac.uk/media/teaching-and-learning/policies/AcademicAlerts.pdf

Note that a "FINAL" alert can result in a student receiving grade 0 for the module with no right to a reassessment examination, ie they will get a fail for the module. That zero will also form part of the calculation for the classification of the honours degree, even if the module is taken and passed in a subsequent semester.

In honours modules in physics and astronomy, attendance at all classes (lectures, tutorials, and any specified practical work) is strongly recommended and in some cases is a requirement. In order to avoid receiving a "FINAL" academic alert, the requirements for honours modules in the School are :-

- For all modules which are assessed wholly or partly by continuous assessment, a requirement of the module is to achieve a grade of at least 4.0 in the continuously assessed component.
- Gain a mark on each required class test corresponding to a minimum of grade 4.0.
- For the Physics laboratory modules students must attend at least 75% of the laboratory sessions.

- For Computational Astrophysics and Observational Astrophysics, attend at least 75% of the sessions.
- For PH3014 Transferable Skills for Physicists, students must gain at least grade 4 in one of the Review Article and the Burn Conference.
- For PH3080 Computational Physics submit a serious attempt at at least one of the three quizzes.
- For PH5024 Topics in Modern Condensed Matter Physics students must hand in at least 75% of the tutorial/problem sheets, and attend all the presentation sessions.
- For the final year project modules, both the pre-project review AND the final project report must be handed in before one week after their respective deadlines, and must be of a high enough standard to obtain at least 25% in their respective assessments. Additionally, attendance at and active participation in the project oral examination is required.
- For the small group tutorials associated with Maths for Physicists, Maths for Chemistry/Physics, Quantum Mechanics 1, Quantum Mechanics 2, Thermal and Statistical Physics, Electromagnetism, and Solid State Physics, students must attend at least 75% of the small-group tutorials organised for each module, and must submit on time a serious attempt at any specified tutorial work for at least 75% of the stated occasions for each module.

Although it may not formally be part of the Academic Alert system, we remind students that failure to turn up to an exam without good cause, or attaining less than grade 4.0 in an examination, may result in the failure to gain academic credit for that module in that year.

Penalties for late submission and Word/Space Limit Issues

In those cases where work requires to be handed in for marking, a deadline will be defined in advance and one of a defined range of penalties will be applied for late submission, as per the University policy at the link below.

If no specific penalty is noted, then the “default” penalty of the School will be used, ie penalty A stated in the University policy (5% of the maximum available mark per day, or part thereof) . If you are unclear about the penalties associated with the late submission of any piece of assessed work, please contact the member of staff concerned.

It is particularly important that project reports are handed in on time, in view of the large number of credits attached to these modules.

Students are expected to be at exams, class tests, presentations, oral assessments and other scheduled assessments, and will be given a zero if they do not attend without good reason.

Where word or page limits apply to a piece of work to be submitted, any penalties for not satisfying the criteria will be published to students in advance. If no specific penalty is noted, then the "default" penalty is penalty A in the University policy.

www.st-andrews.ac.uk/media/teaching-and-learning/policies/penalties.pdf

Absence from Classes, Tests, or Examinations

If, for any reason, you are absent from a module, you should complete as soon as possible a Self Certificate for Absence (through e-Vision). There is usually no need to self-certify for missing a lecture, but any illness etc that affects assessed work or compulsory activity (eg tutorial, lab work, class test) must be noted. If you are absent from a small-group teaching session it is polite also to inform the tutor or demonstrator directly, please. If you miss assessed work or a compulsory activity you should communicate as soon as possible with the responsible person to determine what you should do to try to fill the learning or assessment objectives. You should be aware of and act upon the University policies on Academic Alerts and on Student Absence.

Absence from Examinations, which is a serious matter, due to illness or any other unavoidable reason should be reported by submitting a Self Certificate of Absence form (through e-Vision) as soon as you are able to do so, preferably before the examination is due to take place, and in any case no later than three days after the examination. You must also contact the School responsible for the module being examined in order to let them know and to request alternative arrangements. For this School please contact both physics@st-andrews.ac.uk and b.d.sinclair@st-andrews.ac.uk, or speak with one of the office staff on the phone 01334 463111.
www.st-andrews.ac.uk/students/advice/academic/exams/

Special Circumstances Affecting Assessment

Unfortunately, some students will suffer unavoidable circumstances that impede their academic performance. These may include illness or bereavement of a close family member. If you find yourself in this position, you should alert the School's Director of Teaching as soon as possible. You can do this directly, or through Student Services. Depending on the circumstances it may be possible for the School to agree to defer a

piece of assessment (including exams) to a later date. The University policy on deferred assessments is included in
http://www.st-andrews.ac.uk/media/teaching-and-learning/policies/APP.pdf

It may also be possible for the School to "S-code" a module result, which indicates that the assessment of that module has been affected by special circumstances. S-coding can only be done at the request of a student and cases normally have to be notified very close to the time at which the problem occurs, and normally before any examination is taken. A maximum of 25% of the required honours credits of any student may be S-coded. Passing grades which are S-coded may be temporarily disregarded for the purpose of degree classification, if this is to the advantage of the student. The "S" coding remains on the student's record and transcript. The current University policy is that deferral of assessment is usually preferred to S-coding.

In some cases, for example of longer term illness, the appropriate mechanism to assist the student is a "leave of absence" and/or "discounting of studies". This should be discussed with an Adviser at Student Services, though the School's Director of Teaching can give some advice on the process and implications.
http://www.st-andrews.ac.uk/media/teaching-and-learning/policies/leave-of-absence.pdf

Good Academic Practice, and Academic Misconduct

Academic integrity is fundamental to the values promoted by the University. It is important that all students are judged on their ability and performance, and no student will be allowed unfairly to take an advantage over others, to affect the security and integrity of the assessment process, or to diminish the reliability and quality of a University of St Andrews degree. All students are urged to exhibit good academic practice.

Academic misconduct includes the presentation of material as one's own when it is not one's own; the presentation of material whose provenance is academically inappropriate; and academically inappropriate behaviour in an examination or class test. Any work that is submitted for feedback and evaluation is liable for consideration under the University's Academic Misconduct policy irrespective of whether it carries credit towards your degree. All work submitted by students is expected to represent good academic practice. "Not knowing" the regulations is not regarded as an acceptable excuse for academic misconduct.

You should be aware that the University takes academic misconduct offences extremely seriously, and penalties even for first offences can be severe.

All students should familiarise themselves with the University's policy document at

www.st-andrews.ac.uk/media/teaching-and-learning/policies/gap.pdf

Students who are unsure about the correct presentation of academic material should approach their tutors or lecturers, and may also contact CAPOD for advice and training.

Examples of plagiarism at honours level include (a) the copying of part of another student's laboratory report which is then passed off as one's own work, and (b) in the course of writing an essay or project report, "lifting" excerpts from published books, papers or articles on the Internet and incorporating them, without proper acknowledgement, in one's own essay or report.

If you ever need to use textual material verbatim from another source, its appearance in your work MUST be within inverted commas, and the source attributed beside that appearance. If you use a picture or diagram produced by someone else you must acknowledge the source in the caption to that picture.

Some student work may be submitted to an electronic tool to check for such problems. The University's procedure will be applied whenever instances of plagiarism or similar practices are detected. However students should carefully distinguish plagiarism from the assistance which they derive by discussing their work with others and, in some approved cases, carrying out their work in collaboration with others. The latter has genuine and legitimate value to the student and is encouraged, whereas plagiarism is at best "poor practice" and at worst "cheating".

Use of Calculators in Examinations

Students should note that the Senate has prohibited the use of certain calculators in examinations, viz. those with programming, text, symbolic or graphical capabilities.

The 0-20 Grading Scale

The University uses a 20-point Common Reporting Scale for module grades. Details of the Common Reporting Scale can be found at
www.st-andrews.ac.uk/staff/teaching/examinations/scale/
The minimum grade for which credits for the modules are awarded (i.e. a bare pass) is 7.0.

The University applies a common formula for the calculation of the award of Honours classifications. Degrees are classified using a credit-weighted calculation of grades

achieved for Honours-level modules (3000 level and above) taken during an approved Honours programme. Details are published at
www.st-andrews.ac.uk/staff/teaching/examinations/honours/

When the University runs the degree classification system, a credit-weighted mean grade of 16.5 over the appropriate (and all passed) honours modules will result in a first classification, independent of the median grade. Similarly, a credit-weighted mean grade of 13.5 is enough to result in an upper second, and 10.5 a lower second.

Thus it can be seen that while 7.0 is a "pass" in a module, achievement at just this level in all modules will not result in obtaining an honours degree.

In our School, normal practice is to assess submitted work in terms of percentage marks, combine various components where needed, and then convert the final module percentage mark to the module grade by a mapping procedure. In honours modules that include marks from both a module exam and continuous assessment, the overall mark is normally determined by the weightings given to these two components as published in the University's Course Catalogue. The exception to this is that any student who obtains a mark in a module examination corresponding to grade 3.9 or less will have the module grade determined as above, but subject to a maximum module grade of 3.9.

The current mapping scheme normally adopted by the School for converting percentage marks to grades at honours level is as follows, *and is different to the mapping used for our level one and two modules*. Grade 5.0 corresponds to 25%, grade 7.5 to 38%, grade 16.5 to 74% and grade 20.0 to 100%. Between these fixed points, linear conversions apply. Thus 36% is mapped onto grade 7.1, and 50% is mapped into grade 10.5. This is shown in a different form on the next page, where the classification boundaries are shown for the credit-weighted mean grades over a complete honours programme. The credit gained, fail, and re-assessment boundaries are for a single module. In principle the module board, which includes the external examiner, has the authority to change the mapping for any module. However, we aim not to need to do so, and this happens relatively rarely.

Any grade followed by the letter S indicates that the performance of the student in that module was affected by special circumstances, e.g. illness. A "D" on a transcript shows that the assessment has been deferred to a later time. A "Z" shows that the grade has yet to be determined.

%	grade		%	grade		%	grade
15	3.0		50	10.5	2II, threshold	85	18.0
16	3.2		51	10.8		86	18.1
17	3.4	no re-	52	11.0		87	18.3
18	3.6	assessment	53	11.3		88	18.4
19	3.8	possible	54	11.5		89	18.5
20	4.0	reassessment	55	11.8		90	18.7
21	4.2	possible	56	12.0		91	18.8
22	4.4		57	12.3		92	18.9
23	4.6		58	12.5		93	19.1
24	4.8		59	12.8		94	19.2
25	5.0		60	13.0		95	19.3
26	5.2		61	13.3	2II, top	96	19.5
27	5.4		62	13.5	2I, threshold	97	19.6
28	5.6		63	13.8		98	19.7
29	5.8		64	14.0		99	19.9
30	6.0		65	14.3		100	20.0
31	6.2		66	14.5			
32	6.3		67	14.8			
33	6.5		68	15.0			
34	6.7		69	15.3			
35	6.9	fail	70	15.5			
36	7.1	credit gained	71	15.8			
37	7.3		72	16.0			
38	7.5	3rd, threshold	73	16.3	2I, top		
39	7.8		74	16.5	first class		
40	8.0		75	16.6			
41	8.3		76	16.8			
42	8.5		77	16.9			
43	8.8		78	17.0			
44	9.0		79	17.2			
45	9.3		80	17.3			
46	9.5		81	17.4			
47	9.8		82	17.6			
48	10.0		83	17.7			
49	10.3	3rd, top	84	17.8			

Progression

Progression within an honours programme

Continuation into the next year of the programme is conditional on satisfying the examiners at the end of the current year. The rules used are intended to be in the best interests of students.

For progression into the SH year, it will normally be necessary for honours students to achieve in JH modules a credit-weighted mean of at least 10.5 for those on the honours BSc programme or 13.5 for those on the MPhys and MSci programme, and with all modules with at least grade 7.0. The student will normally need to have at least 115 credits from their JH year. A candidate who fails to satisfy the examiners may be recommended for the award of a General Degree, or may be required or recommended to switch from a Master's degree to a Bachelor's degree.

Theoretical Physics students need to have particularly high levels of competence in mathematical physics in order to thrive on these programmes. For this reason, those on the MPhys Theoretical Physics and MPhys Mathematics and Theoretical Physics programmes should be able to demonstrate acceptable performance in such modules by mid-way through the JH year. In this case, "acceptable" would normally entail gaining at least grade 13.5 in each of PH3061 Quantum Mechanics 1, PH3081 Maths for Physicists (where taken), and MT3501 Linear Maths (where taken), and a mean of 13.5 over all the modules taken in first semester of JH. For those on the joint degree programme the review will normally involve input from both Schools.

At the end of JH students on either MPhys programme involving Theoretical Physics are expected to have obtained at least grade 13.5 in each of PH3061 Quantum Mechanics 1, PH3062 Quantum Mechanics 2, PH4038 Lagrangian and Hamiltonian Dynamics, and PH3007 Electromagnetism. Additionally, those on the programmes involving Theoretical Physics will have their grades monitored at the end of semester one of SH. Those who have not been reaching grades of 13.5 and above in SH will be subject to a review process and may be advised or required to change to the BSc degree even at this late stage.

Moving from BSc honours to MPhys honours programmes

Those who have obtained entry to the BSc honours programme and who do sufficiently well in JH may be permitted to move to the MPhys cohort. Those seeking access to the MPhys in Theoretical Physics or Maths and Theoretical Physics will have any request considered after the results from first semester are known. Those seeking access to all the other MPhys programmes will have any request considered after the results from semester one and two are known. The University has set a 15.0 grade threshold for permitting movement, and this will be based on the credit-weighted mean of all honours modules with AS or PH codes, plus adviser-approved honours MT modules.

Deans' List

The University has an annual award for academic excellence, promoted by the Deans. Undergraduate students who achieve an outstanding overall result in the course of an academic year have their names inscribed on the Deans' List, an honour which will also appear on their University transcript.

Any student who meets all the criteria and who obtains a credit-weighted mean grade of 16.5 or above for the year will be recorded on the Deans' List. Full details of all the criteria and conditions for the Deans' List are available at:
www.st-andrews.ac.uk/students/academic/awards/universityprizes/deanslist/

Medals and Prizes

At each level (Junior Honours, Senior Honours and year 5) a class medal is awarded annually to each of the highest graded students of Physics, Theoretical Physics, and Astrophysics, provided that at least one student in each category is deemed worthy of the award (ie credit weighted mean is at first class level).

In addition, the following prizes are awarded:

William David Brodie Prize (normally three awards). Awarded to the three students in the Junior Honours class with the most outstanding results, without restriction on degree programe.

Neil Arnott Prize (normally three awards). Awarded to the three students with the most outstanding results in the Senior Honours class in Physics, which for this purpose includes Theoretical Physics.

Scott Lang Prize. Awarded to the Senior Honours student in Astrophysics with the most outstanding results.

Brewster Prize. Awarded to the student with the most outstanding results in the final year of any one of the undergraduate Master's degrees (MPhys or MSci), in the School of Physics and Astronomy.

In all cases awards are based on the highest credit-weighted mean grade from the School's modules achieved during the year. If there is more than one "best student" in a category, then the medal or prize is shared.

Since joint honours students are presumed to be eligible also for prizes offered in the other subject, the policy of the School is that the monetary amount of a prize awarded to any student in this category is halved. In all cases for students to be eligible for a prize from this School they must be taking at least 45 AS and/or PH credits that session.

Feedback on Assessed Work, & Access to Examination Scripts

You should be able to receive routine feedback on any work that you are asked to submit. Feedback will give you advice that should guide you in improving your learning and future performance. Feedback can include discussions in tutorials, individual face-to-face discussion, written commentaries on work, generic feedback to the class on an assignment or examination, or electronic feedback for example through Moodle. If you are not clear about what the feedback is saying, or wish advice on your best course of action, please contact the relevant staff member to discuss with them.

Feedback on examination performance can be given to a class as a whole. If you wish detailed feedback from a member of academic staff on an examination script, you should contact your year coordinator in the first instance to arrange a suitable meeting. No fee is charged for viewing the script. Students are however also entitled to request a hard copy of any of their own completed examination scripts. If a photocopy of the script is required for personal reference, please contact the School Office and, on payment of a fee of £10 per examination script to the University, a photocopy will be provided for you within five working days. Such requests should be made by the end of Week 3 of the semester that follows the examination diet.

Appeals and Complaints

The University is committed to ensuring as high a quality student experience as possible while studying at St Andrews. Occasionally things may go wrong and if you are experiencing a difficulty, or are dissatisfied with your academic experience, you should raise concerns as soon as possible. This allows effective resolutions to be worked out quickly. The University web site gives full information on how students should pursue a complaint or appeal, whether this concerns an academic or non-academic issue. One guiding principle is that students should attempt first to resolve the issue by an informal approach to the member of staff most directly concerned. If that fails, there are available further stages by which the matter may be pursued.

Within the School of Physics and Astronomy, any complaint or appeal should be addressed (after the informal approach has been tried) to the Director of Teaching or, if the Director of Teaching has already been involved, to the Head of School. Academic issues which could be the subject of an appeal or complaint may include the method by which marks were awarded to assessed work, or any allegation of harassment or bullying.
www.st-andrews.ac.uk/students/rules/appeals/policy/

The Students' Association provides independent and confidential help and advice for students who are contemplating submitting an academic appeal, complaint or are having discipline proceedings taken against them. The Students' Association employs Iain Cupples, the Student Advocate (Education), whose job it is to ensure that you receive help with writing and submitting a submission. Iain can also accompany you to any hearing. He should be your first point of contact as soon as you feel you need help.

Contact:- Iain Cupples, Student Advocate (Education) Telephone: 01334 462700 Email: inc@st-andrews.ac.uk

Ethics (UTREC)

All research in all Schools of the University that involves data collection (from questionnaires etc), interviews of, interactive investigation of, experimentation upon or demonstrations involving living human subjects, tissues and / or other samples requires formal approval from the University Teaching and Research Ethics Committee (UTREC).

It is University policy that any research involving children under 18 should be reviewed by the UTREC Child Panel and that the researcher should hold an appropriate Disclosure certificate. The principal supervisor is responsible for ensuring that the student has received the appropriate ethical clearance from UTREC and the Child Panel prior to research commencing.

It is a requirement that any undergraduate honours or Masters dissertation or PhD thesis that requires ethical approval from UTREC has the letter or email of ethical approval bound into the appendix before submission.
http://www.st-andrews.ac.uk/utrec/

Diversity, Respect, Community

"The University of St Andrews is fully committed to respect and fair treatment for everyone, eliminating discrimination and actively promoting equality of opportunity and delivering fairness to all."
www.st-andrews.ac.uk/hr/edi/equalityschemeandpolicies/equalitypolicy/
We are keen that this School continues to be a place where we all value and respect each other, and that we continue to have here a community of scholars that includes students and staff. The School's Equality and Diversity Committee, which includes the School President, actively promotes this endeavour. Its web pages are linked to from the School's Students and Staff web page. We are pleased to have "Juno Practioner" status from the UK Institute of Physics following submission to them of details of our activities aiming to provide a workplace that is good for all. We are working towards Juno Champion status. Students with concerns or suggestions about equality or diversity are asked to speak to one of the committee.

Information for students

Our School's "Students and Staff" web page contains a range of useful information, including links to our module handbooks, honours module synopses, timetables, booklists, internship and careers information, the student physics and astronomy societies, and other

resources. Moodle and MMS will be used as managed learning environments and for mark reporting.

The "Current Students" page linked to the Home page of the University's web site contains information on a wide variety of issues of interest to students. It includes for example details on academic regulations, codes of practice, employment, financial information, health, Library Services, student organisations, student services, student support and guidance, and access to the pre-advising system, previous examination papers and examination timetables. The University publishes its teaching, learning, and assessment policies at http://www.st-andrews.ac.uk/staff/teaching/strategypolicy/policy/

English Language Support

The In-sessional English Language Service (iELS) offers free language development to matriculated students. The language development is offered in a number of forms, ranging from one-to-one tutorials to workshop programmes on, for example, writing, presenting, pronunciation, and grammar. We also have a wide range of online resources that you can study at your own pace. Further information is available on the iELS website and self-enrol Moodle page:
www.st-andrews.ac.uk/elt/iels/
moody.st-andrews.ac.uk/moodle/course/view.php?id=241

If you would like further information, please contact us at iels@st-andrews.ac.uk.

Disabilities Coordinator

If for disability reasons you require support, for example particular teaching and exam arrangements, please contact the Disability Team via the link below. Student Services provides support for a wide range of disabilities such as learning difficulties, visual and hearing impairments, mobility difficulties, Aspergers, mental health, long standing medical conditions, and much more.
www.st-andrews.ac.uk/students/advice/disabilities/

The School's disabilities coordinator (Dr Bruce Sinclair) will liaise with any user of the building who has a disability. Student Services can recommend appropriate modifications to teaching methods/materials for students with disabilities. Our aim is to try to make the same or equivalent facilities and experiences available to all. The School should be notified by Student Services of any recommended actions. However, this notification cannot always be immediate, and students are welcome to contact Dr Sinclair directly to advise him of their situation.

Most of the School is accessible to wheelchair users via the main entrance and the lift. The lift is on the opposite side of the building from the main entrance. If a person who is unable to use the stairs is on level three when there is a fire or other emergency, they should know that there is an evacuation chair in the stairwell outside room 301. They may be able to make their presence known to the janitor or the emergency services using the telephone there.

Work Spaces

The library is one obvious space in the building in which students may study, though it is intended to be a quiet area. The main concourse has group-study tables behind the cafeteria. These are equipped with large screen computer monitors, and it is hoped that groups of students may find this space useful for collaborative working and/or as a noisy self-study space. The main part of the concourse may be used as a study and/or social area. If seminar/tutorial rooms in the building are not booked out for teaching or meetings, it is normally possible to use these for work. The School office staff can provide information on availability.

J F Allen Library

The JF Allen Library is a new and modern Library situated in the Physics and Astronomy building. It has a large number of comfortable, bright and quiet spaces for individual study, seven PCs and two rooms for group work.

There is a wide variety of up-to-date books available in both print and electronic format. Most books can be borrowed for 3, 7 or 28 days. It should be noted that the 28-day loan books are subject to a 7-day recall in the case of someone else wanting to borrow them. There is a self-issue and return machine which allows users to take out books themselves. If you have suggestions for additional physics and astronomy books that you think should be in the Library, please contact Dr Charles Baily (crb6@st-andrews.ac.uk) or email morebooks@st-andrews.ac.uk.

The Library's online reading list service enables you to find and access the books, journal articles, and other resources you are expected to use for your module. By clicking links in online reading lists you can see straight away the location and availability of books in the Library and get direct access to online resources. By logging in you can use the features which allow you to record what resources you've used, plan ahead, and create personal study notes. You can also export citations to Endnote from reading lists.

The Library subscribes to a large number of journals, most of which are available electronically. There are two printer/photocopier/scanners in the Library, operated by your matric card. You can make payments to your account online or by cash at the print credit money-loader located at the entrance to the Library.

To find out if your module has a reading list check the module in MMS or Moodle, or check the Online Reading List page on the Library website
www.st-andrews.ac.uk/library/information/subjectguides/readinglists/

Online resources and information about books available can be searched for through the Library's Physics & Astronomy page: http://libguides.st-andrews.ac.uk/panda. Past examination questions for the last few years are available via iSaint, and tutorial sheets and solutions for some modules are available on Moodle or MMS.

If you need to access a journal paper or a book that is not available in our library, please ask your module coordinator or project supervisor about getting access to this resource via an inter-library loan.

Library staff are present to deal with enquiries, Monday to Friday, between the hours of 10am and 2pm, though the library space is open until 8.30pm, Monday to Friday, with extended opening during revision weeks. Outside staffed hours Main Library staff can offer assistance by email, phone or chat http://www.st-andrews.ac.uk/library/contact/. Vicki Cormie (vhc1@st-andrews.ac.uk) is the Academic Liaison Librarian for Physics & Astronomy and is happy to be contacted for any help in using Library resources.

Computing Facilities

The PC classroom next to the main entrance contains 34 PCs, data projection facilities, scanners and printers. IT services operate many other clusters of computers and provide training in the use of hardware and software as well as the username and password required to log on the computers and for email. Many computers in the honours laboratory will be used by students during their lab/computational sessions, and may often be used outside laboratory time by students in the School for more general work-related activity.

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Student-Staff Council and School President

The Student-Staff Council has representatives for students in each level of study, postgraduate representatives, and members of staff. Its primary purpose is to serve as a forum for the discussion of academic issues, but it also oversees some of the social facilities available in the building and some student activities. The Council normally meets twice per semester. Meeting minutes, etc, may be accessed from the School's Students and Staff web page. The Council is chaired by the School Student President, who is elected by students at the end of the previous session. For 2016-17 the School President is John Weaver. He may be contacted by email at physicspresident@st-andrews.ac.uk.

Student representatives are elected from honours year and subject groups, and normally hold office for the whole academic year. Representatives discuss teaching matters with the Year

Co-ordinator, and report to meetings of the Council on the issues raised and the action taken. Although all students are welcome to discuss any issues directly with the relevant module coordinators or other members of teaching staff, they may also raise concerns or comments with their class reps or the School President for transmission to the relevant member of staff and/or Student Staff Council.

The Vacation Awards Committee disburses grants to students studying in the School who wish to pursue worthwhile projects during the Summer vacation. The Social Committee is responsible for the organisation of the Student/Staff dinner-dance and for some other social events which may take place during the year.

Research Colloquia

These are held approximately weekly in Theatre C of the J F Allen building, usually at 10 on Friday mornings. The topics of these talks are wide ranging, often reflecting the research interests of the School and covering exciting new developments in the general area of physics and astronomy. Honours students are welcome to attend. Some research groups have lunchtime seminars, and relevant students are encouraged to attend these.

Advanced Topics in Modern Physics

This is an optional, not-for-credit series of lectures/seminars in which members of staff and occasional visitors will introduce interesting concepts of modern physics. All honours students are welcome, but should note that the presentations and discussions will be aimed at the higher-achieving members of the Honours class.

SUPA Lectures

The Scottish Universities Physics Alliance uses video-conferencing to deliver presentations in its graduate school. Some of our level five lectures are video-conferenced for this purpose. Students who wish to attend SUPA lectures that are not given by our School are welcome to seek permission to do so.

CAPOD Resources

The University's Centre for Academic, Professional and Organisational Development (CAPOD) can provide additional input to help students develop the skills they need for their academic studies and beyond. There are three main ways:

1. Academic skills: You can book a 1:1 appointment with one of the CAPOD PhD tutors to help you improve your study skills (e.g. note-taking, time management, essay writing) or mathematics and statistics skills. Over 300 students make use of this service each year. There is also a drop-in pod for study skills in the Library every Thursday afternoon.

2. Professional skills: CAPOD runs the Professional Skills Curriculum (PSC) which is a development programme open to all students. It comprises over 30 skills topics which employers value. The topics are delivered via online workshops, lunchtime and evening lectures, and practical skills sessions. There is everything from leadership to resilience; influencing skills to public speaking; project management to networking. You are welcome to dip in and out of the programme as you wish, but if you complete a skills analysis, engage with 8 or more topics over an academic year and submit a reflective essay, you receive a certificate and your achievement is listed on your degree transcript. The PSC is endorsed by the Institute of Leadership and Management.

3. IT skills: CAPOD runs a programme of IT workshops for undergraduate students, including sessions on digital wellbeing, using apps to help you learn, and curating digital content. You also have the opportunity to self-study and sit exams for a Microsoft Office Specialist (MOS) certificate which is a globally recognised IT qualification. Taking part in MOS is free of charge for students at St Andrews.

There is more information on the CAPOD webpages
www.st-andrews.ac.uk/capod/students
or in the CAPOD office (Hebdomadar's Block, St Salvator's Quad).

Programme-specific fees

There are no additional fees for labs and the like in the School. Students in the Transferable Skills for Physicists module are normally expected to attend the Burn Conference, and are asked to make a contribution towards the costs of the weekend away (probably £30). In line with University policy, the School expects its students to purchase a number of textbooks as part of their study.

Careers and Research

The University Careers Centre, situated opposite the Students Union building, is available for students to explore career options. It has an online and physical library detailing various career opportunities as well as job vacancies. Careers fairs and seminars take place each year. A huge amount of careers-related information can be found at the web site www.st-andrews.ac.uk/careers, including a wiki section aimed at physicists and astronomers.

All students are encouraged to talk with a Careers Adviser during their JH year. The module PH3014 Transferable Skills for Physicists includes activities that are directly associated with

employability considerations. The School's liaison officer with the Careers Centre is shown in the key contacts page later in this handbook.

It is important to make plans regarding your career fairly early during the final years of your degree programme, preferably in your penultimate year. Some positions may need summer vacation work experience, and some research applications have early deadlines. Representatives from industrial firms and Government laboratories visit the University through the session under the auspices of the Careers Centre. Members of staff in the School will be available to give specialised advice on request, and may agree to write references on your behalf. Students are assumed to have authorised any member of staff whom they have asked for a reference to release personal information about them on a confidential basis.

When thinking about job opportunities it may be helpful to you to consider the following areas where you could pursue a career with a background in physics or astronomy: (a) in industry or an industrial research association, (b) in government agencies, (c) in university laboratories, (d) in teaching in technical colleges or schools, (e) in hospitals, (f) in the armed services, (g) in the commercial and financial sectors, (h) in environmental studies. A good honours degree should qualify you for a job in any of these groups.

If you wish to continue advanced studies with an eye to working in a high technology industry, then you might consider a vocational MSc course. For example, St Andrews in collaboration with Heriot-Watt University offers an MSc course in Photonics and Optoelectronic Devices which provides a postgraduate training for those wishing to enter the laser and optoelectronics industries. A wide range of MSc courses is available in other universities, and we now run an MSc in Astrophysics. Success in such courses can often lead to your being accepted to continue your studies for a PhD, if you so wish.

Students who graduate with a First Class or upper Second Class honours degree are eligible to apply for funding as research students for an MPhil or PhD degree, either here or elsewhere. Should you choose to remain in St Andrews, you will find a School that is very successful in securing external funding for a wide range of research activities in areas such as condensed matter physics, optoelectronic and laser devices, theoretical physics, observational and theoretical astronomy, biophysics, and ultra-low temperature magnetism, and having direct contact with a large number of industrial concerns. Full information on the research activities of the School, and information about sources of grants and scholarships, is available on the web site of the School.

If you hope to do research in another university or institute of higher education you should contact the department in which you wish to work. Advice on which universities are active in your chosen field may be obtained from an appropriate staff member in our School.

It is important that, after graduation, you should respond to any enquiry from the Careers Centre regarding your current occupation, please. Responses to such enquiries form the basis of statistical information supplied to the central body which assembles data for the UK Higher Education System, thereafter used by news media for the construction of university

league tables. Failure to respond therefore undermines, however unintentionally, the likely success your University in maintaining a favourable position in future league tables.

Finding Referees

Students are likely to wish to use members of academic staff as referees in job applications. To this end, they are advised to cultivate a professional relationship with appropriate staff members. The more a member of staff knows about a student, the more useful a reference they can write. It is thus most likely that a student's project supervisor or a tutor would be in a good position to write a reference. Students should seek the permission of staff members to use them as referees before naming them. As staff members are not permitted to disclose information about students without explicit permission, potential referees may ask for written statements from students authorizing disclosure. It may be worth noting that student attitude and attainment through their time at St Andrews can be relevant, which may be another reason for working hard throughout the degree programme.

Health and Safety

The Head of the School of Physics and Astronomy, as part of his responsibilities for safety within the School and its buildings, requires all persons who enter the buildings for any purpose to take reasonable care of the health and safety of themselves and of others. The School's safety policy is available via the "Students and Staff" page of the School website. The School Safety Officer is Mr Derek Milroy, ext 3198, dm219.

Anyone requiring First Aid during normal hours should contact one of the School first aiders: Mr Mark Clifford, Mrs Linda Cousins, Mr Paul Donaldson, Mr Steve King, Mr Mark Robinson, Mrs Sarah Webster, or ask any member of staff to do this for them.

First aid boxes are located at the main entrance, outside room 301, and at the lift entrances. An emergency evacuation chair for those with mobility difficulties is located in the corridor outside room 301.

Anyone who is in the J F Allen building outside the time during which there is janitor cover should sign in and out in the book at the janitors' desk.

Advice and Support

If you need advice, then you should feel free to contact any member of academic or secretarial staff in the School; they may be able to help you directly or should be able to tell you who to contact for particular advice. Please feel free to ask questions of your lecturers,

tutors, lab demonstrators, or advisers of studies. In a number of cases the paragraphs above suggest who might be the most appropriate person to speak with.

For general queries on academic and other issues, your Adviser of Studies or the School's Director of Teaching may both be good people to start with. If you wish to speak with your Adviser of Studies and they are not available, the School's Director of Teaching would be an appropriate alternative.

If you wish to speak with specialists in student welfare, then Student Services may accessed by email at theasc@st-andrews.ac.uk or via the Advice and Support Centre at 79 North St (01334 46) 2020. These people can provide professional support. They are particularly well placed to help with problems affecting your studies or personal life, including academic matters, finance, accommodation, health and disability, relationships, stress or anxiety. They also offer special assistance for international students. I am told that the majority of students seek advice from Student Services during their time in St Andrews. They are used to assisting students with problems small and large, serious and much less so.
http://www.st-andrews.ac.uk/students/advice/

If there is a problem, please talk with the School or Student Services sooner rather than later.

The School also provides advice on "Who can advise or help me?" on particular issues. This is on the main academic notice board and online via the student section of the School's Staff and Students web page.

Academic Session

The School's timetables may be accessed from the School's Students and Staff web page. The dates for the session, including examination periods, are published on the University's web pages.

Orientation Week is an integral part of the University semester, and students are expected to devote some time in this period to their studies. Most classes in this School will run on the Thursday and Friday of Orientation Week in the same slots as timetabled in the rest of the semester. Please see the Orientation Week timetable on the School website.

Independent Learning Week has no scheduled classes, but is a good chance to spend time consolidating your studies in the semester up to this time. There may also be work set to be done over that week.

Students are expected to be available for the entire examination period.

Appendix 1 - Key Contacts/Coordinators

School Level		**Room**	**Email**
Head of School	Prof Graham Turnbull	215	hospanda
Deputy Head of School	Prof Ifor Samuel	209	idws
Director of Teaching	Dr Bruce Sinclair	221	b.d.sinclair
Director of Research	Prof Ifor Samuel	209	idws
Director of PostGrad Studies	Dr Jonathan Keeling	213	physdopg
Secretary (teaching matters)	Mrs Linda Cousins	211	physics
School Senior Secretary 01334 463100	Ms Lesley Aitken	211	physics

Coordinators/advisers

General Degree Students	Prof Jardine, Drs Koenig and Smith as in pre-honours		
Junior Honours	Prof Ian Bonnell	312	physadvjh
Senior Honours	Dr Donatella Cassettari	218	physadvsh
Level Five	Dr Charles Baily	310	physadv5

Module and programme coordinators

Physics labs	Dr Cameron Rae	132c	cfr
Computational Astrophysics	Dr Peter Woitke	306	pw31
Observational Astrophysics	Dr Claudia Cyganowski	335	cc243
Transferable Skills	Dr Bruce Sinclair	221	b.d.sinclair
Overall Project Coordinator	Dr Phil King	333	pdk6
Physics projects	Dr Phil King	333	pdk6
Theoretical Physics projects	Dr Jonathan Keeling	213	jmjk
Astrophysics projects	Dr Christiane Helling	313	ch80
Other Modules	Please see appendices		

Other

Examination Officer	Prof Steve Lee	318a	sl10
Special Needs Coordinator	Dr Bruce Sinclair	221	b.d.sinclair
Study Abroad Adviser	Dr Charles Baily	310	crb6
Health and Safety Officer	Mr Derek Milroy	207	dm219
First Aid	Mrs Linda Cousins	211	physics
S-coding etc requests	Dr Bruce Sinclair	221	b.d.sinclair
Diversity committee chair	Dr Vivienne Wild	308	vw8
Careers Officer	Dr Lucy Hadfield	304	ljh11
School Student President	Mr John Weaver	physicspresident	

Telephone numbers are available on the next page

Appendix 2 – Some Staff Members

Lecturing Staff	***Room***	***ext***	***email***
Baily Dr C	310	3127	crb6
Bonnell Prof I A	312	3140	iab1
Braunecker Dr B	336	1673	bhb
Brown Dr C T A	216	3129	ctab
Cameron Prof AC	315	3112	acc4
Cassettari Dr D	218	3109/3186	dc43
Cornwell Prof J F	340	1676	jfc
Cruickshank Dr P	305	3296	pasc
Cyganowski, Dr C	335	1672	cc243
Dholakia Prof K	217	3184	kd1
Di Falco Dr A	342	3165	adf10
Dominik Dr M	242	3068	md35
Dunn Prof M H	214	3119	mhd
Gather Prof M	207B	3108	mcg6
Gillies Dr A D	231	3179	adg1
Hadfield Dr L J	304	3144	ljh11
Helling Dr Ch	313	1666	ch80
Hooley Dr C A	206	3171	cah19
Horne Prof K D	315A	3322	kdh1
Jardine Prof M M	318	3146	mmj
Keeling Dr JMJ	213	3121	jmjk
Kemp Dr J	Music	2145	jk50
King Dr P D C	333	3067	pdk6
Koenig Dr F	204	3128	fewk
Kohnle Dr A S	314	3195	ak81
Korolkova Dr N	311	3139	nvk
Lee Prof S L	318A	3143	sl10
Leonhardt Dr I	210	3103	il4
Lovett Dr B	205	3107	bwl4
Lovett Dr J	243	3120	jel20
Mazilu Dr M	337	3210	mm17
Mortier Dr A	255	3053	am352
O'Faolain Dr L			jww1
Penedo Dr C	285	3106	jcp10
Rae Dr C F	132C3	7314	cfr
Samuel Prof IDW	209	3114	idws
Scholz Dr A	311	1668	as110
Sicilia-Aguilar Dr A	255	3053	asa5
Sinclair Dr B D	221	3118	b.d.sinclair
Smith Dr G M	219	2669	gms
Tojeiro Dr R	317	3115	rmftr
Turnbull Dr G A	215	3100	gat
Wahl Dr P	208	3122	gpw2
Wan Dr K K	340	1676	kw
Weijmans Dr A-M	334	2823	amw23
Wild Dr V	308	1680	vw8
Woitke, Dr P	306	1681	pw31
Wood Dr K	316	3116	kw25
Zhao Dr H	316A	3135	hz4

Office Staff

Aitken Ms L M	211	3100	lma1
Vithanage Dr D	211	1682	da16
Cousins Mrs L J	211	3111	ljc21
Nicholson Mrs P	210	3103	pkwm

Building, Safety and Technical Manager

Milroy Mr D	232	3198	dm219

Teaching Laboratory Technicians

Donaldson Mr P	324	3132/3148	ptd
Clifford Mr M	324	3132/3148	mac5

Head Janitor

Muir Mr G J		3136	jan-phys

First Aiders

Clifford Mr M	324	3132/3148	mac5
Cousins Mrs L J	211	3111	ljc21
Donaldson Mr P	324	3132/3148	ptd
King Mr S	132c2	7309	sk18
Robertson Mr M	130	3276	msfr
Webster Mrs S J	207	7332	sjw25

Generic School Contact Details

School Office	211	3111	physics

School Office opening hours
Monday-Friday 08.45 - 13.00, 13.30 – 17.00

Photos of most staff members are available on the School's web pages and on a poster board by the Main Entrance to the School

Appendix 3 - Modules in 2016-17

First semester

Sem 1			**16-17**	**Comments**
AS4025	Observational Astro	15	CC, ASA, ACC	Astro 2 pre-req
AS4010	Extragalactic Astro	15	VW, KDH	Compulsory for Ast
AS4011	Nebulae & Stars 1	15	KW	Compulsory MPhys Ast
AS5001	Advanced Data Analysis	15	KDH	
AS5002	Magnetofluids & Sp. Plasma	15	MMJ	Fluids recommended
AS5003	Contemporary Astrophysics	15	HSZ, AM, ASA	Astro students only
ID4001	Comms & Teach in Sci	15	BDS+	Entry by interview
PH3061	Quantum Mechanics 1	10	ASK	All programmes
PH3074	Electronics	15	PASC	Compulsory Phys MPhys
PH3080	Computational Physics	15	MM, ADG	Compulsory for most
PH3081	Mathematics for Physicists	15	CRB	Compulsory for most
PH3082	Maths for Chem/Phys	20	CRB, MM, ADG	PH3081 plus half PH3080
PH4022	*Nuclear & Particle Physics*	*10*	*ASK*	*Being replaced*
PH4027	Optoelectronics & NLO	15	IDWS/MM	
PH4032	Special Relativity & Fields	15	NVK	Compulsory TP; Lagrangian &HD prereq
PH4034	Laser Physics 1	15	FEWK	
PH4036	Physics of Music	15	JKemp	
PH4039	Solid State Physics	15	CAH	
PH4040	Nuc&Part with Adv Skills	15	ASK, BDS	N&PP from PH4041 + some PH3014. Some joints only
PH4041	Atomic, Nuc. & Part. Physics	15	ASK, DC	Compulsory for most
PH4105	Physics Laboratory 2	15	CFR+	Compulsory Phys
PH5002	Foundations of QM	15	KKW	Compulsory TP
PH5003	Group Theory	15	JFC	
PH5004	Quantum Field Theory	15	JMJK	Compulsory TP
PH5005	Laser Physics 2	15	BDS, LO'F,CTAB	Las Phys 1 recommended
PH5011	General Relativity	15	MD	Special Rel recommended
PH5012	Quantum Optics	15	NVK/FEWK	Advanced QM prereq
PH5014	Interacting Electron P	15	CAH	
PH5015	Applications of QPhys	15	DC/MM	
PH5016	Biophotonics	15	CTAB/MG/CPE	Optics or LasP1 prereq
PH5023	Monte Carlo Radiation Tran	15	KW	
PH5024	Topics in Mod Cond Matt P	15	PDK, GPW	

Second semester

Sem 2			15-16	Comments
AS3013	Computational Astro	15	PW, ChH, KDH	Compulsory Ast
AS4012	Nebulae & Stars II	15	ACC, PW	N&S1 preq, comp M Ast
AS4015	Gravitational & Accretion Physics	15	IAB	
PH3007	Electromagnetism	15	CRB	All programmes
PH3012	Thermal & Statistical Phys	15	SLL/IL	All programmes
PH3062	Quantum Mechanics 2	10	ASK	All programmes
PH3101	Physics Laboratory 1	15	CFR+	Compulsory Phys
PH4025	Phys of Electronic Devices	15	AdiF	
PH4026	Signals and Information	15	PASC, GMS	
PH4028	Advanced QM	15	BWL	Compulsory for TP
PH4031	Fluids	15	MMJ	
PH4035	Principles of Optics	15	FEWK	
PH4038	Lagrangian & H Dynamics	15	BHB	Compulsory all MPhys
PH4042	C. in Atomic Phys & Mag Res	15	GMS,DC,JL,GPW	
PH4043	Studies in Chemistry/Physics	5		Chem/Phys joints only

Both semesters

AS4103	Astrophysics BSc Project	30	ChH+	Compulsory Astro BSc
AS5101	Astrophysics MPhys Project	60	ChH+	Compulsory Astro MPhys
PH3014	Transferable Skills for Phys	15	BDS+	Needed for all single hons
PH4111	Physics BSc Project	30	PDK+	Compulsory Physics BSc
PH4796	Joint Degree BSc Project	30	PDK+	Option for joint degrees
PH5101	Physics MPhys Project	60	PDK+	Compulsory Phys MPhys
PH5103	Theoretical P. MPhys Project	60	JMJK+	Compulsory TP MPhys

These lists are subject to change. Please see appendix 2 for staff initials. When more than one staff member is listed the first person is expected to be the module leader.

Pre-requisite modules are shown in the University's Module Catalogue. All modules need the material and skills developed in level two physics and maths. Later honours modules will assume competence with the material and skills in the earlier compulsory modules.

Appendix 4 –Honours Programme

In the tables in the following pages we list the compulsory modules for each programme. Students select additional modules, normally in physics/astrophysics or in their joint degree subject. Honours BSc degrees require a minimum of 240 credits to be gained during the two year honours programme, of which at least 210 credits must be at 3000 and 4000 level and at least 90 credits must be at 4000 level. MPhys and MSci degrees require a minimum of 360 credits to be gained during the three year honours programme, of which at least 330 credits must be at 3000, 4000 and 5000 level and at least 120 credits must be at 5000 level.

Almost all students will take the following core modules:-

PH3061 Quantum Mechanics 1	
PH3062 Quantum Mechanics 2	
PH3081 Mathematics for Physicists	*Optional for some joint degrees with Maths, part of PH3082 for joint degree with Chemistry*
PH3012 Thermal and Statistical Physics	
PH3007 Electromagnetism	
PH3014 Transferable Skills for Physicists	*Most joint degree students cover some of this in PH4040, Chem/Phys cover some in PH4043*
PH4041 Atomic, Nuclear and Particle Physics	*For most joint degrees the nuclear and particle physics section is taken as part of PH4040*

The other modules taken will depend on the choice of degree programme and on student choice amongst optional modules.

The formal statement for required modules is in the University's Module Catalogue.
www.st-andrews.ac.uk/coursecatalogue/ug/
Here we first show schematically how the degree programmes might plan out, and then show the University's requirements in tabular form.

Single Honours Degrees, Third Year, Junior Honours

First Semester		Second Semester		
All		**Physics B & M**	**Theor Phys M**	**Astro B & M**
		Physics Lab 1	Lag. & Ham. Dyn.	Comp. Astro
Choice#		PH3012 Thermal and Statistical Physics		
Maths for Physicists		PH3007 Electromagnetism		
Quantum Mech 1		PH3062 Quantum Mechanics 2		
Comp. Physics				
PH3014 Transferable Skills for Physicists				

AS4010 Extragalactic Astronomy for Astronomers, *PH3074 Electronics* for MPhys Physics, and *MT3501 Linear Mathematics II* for MPhys Theoretical Physics.

BSc Single Honours Fourth Year, Senior Honours

First Semester			Second Semester	
Physics	**Astrophysics**		**Physics**	**Astrophysics**
PH4041 Atomic, Nuc, & Particle Phys			Physics Project	Astro Project
Solid State Physics	Neb. and Stars I*			
Physics Lab 2	Obs. Astro*		Choice	Grav. & Accret.*
Choice	Extragalactic Ast #		Choice	NebStars2*,Fluids*

* BSc Astronomers take at least two of *Obs. Astro., Nebulae and Stars 1* and *2, Grav. & Accretion Physics*, and *Fluids*; this can leave choice of other modules. We ask for Electromagnetism to be taken in JH, but if this has not happened it should be here.
# Normally already taken in JH and, if so, a choice here.

MPhys Single Honours Fourth Year, Senior Honours

First Semester			Second Semester		
Physics	**Theor Phys**	**Astro**	**Physics**	**Theor Phys**	**Astro**
PH4041 Atomic, Nuc, & Particle Phys			L.&H.Dyn	Adv QM	L.&H.Dyn
Solid State Physics		Neb&Stars1	Choice	Choice	Grav&Acc*
Phys Lab 2	Special Rel	Extragal#/ch	Choice	Choice	Neb&Stars2
Electronics# or choice	Lin. Maths# or choice	Obs Astro*	Choice	Choice	Choice inc Fluids*

*MPhys Astronomers take at least two of *AS4025 Observational Astrophysics, AS4015 Gravitational & Accretion Physics*, and *PH4031 Fluids*. We ask for PH3007 Electromagnetism to be taken in JH, but if this has not happened it should be here.
Normally already taken in JH and, if done so, there is a choice here.

The final year (year five) of the MPhys programmes has a compulsory major project (full time for second semester), plus a mix of compulsory and optional modules dependent on the degree programme being taken.

BSc Joint Honours Degree Logic and Philosophy of Science and Physics

Junior Honours

PH3061 Quantum Mechanics One 10	PH3007 Electromagnetism 15
PH3081 Mathematics for Physicists 15	PH3062 Quantum Mechanics Two 10
PH3080 Computational Physics 10	*30 Philosophy choice*
PY3701 (Lang & Reality) 30	

Senior Honours – if with Physics project

PH4040 Nuc & Particle Phys wAdSk 15	PH3012 Thermal and Stat Physics 15
Something not Phil (no 15 credit modules) eg a physics module 15	Something not Phil (no 15 credit modules) 15 eg a physics module 15
Philosophy choice30	PH4111 Physics project 30

Over two years is 90 Phil, 120 compulsory Phys, 30 something other than Phil

Senior Honours – if with Philosophy project

PH4040 Nuc & Particle Phys wAdSk 15	PH3012 Thermal and Stat Physics 15
Physics choice 15	Something not Phil (no 15 credit modules) 15
30 Phil or 2 x15 credits Phys or other	*Philosophy Project 30*

Over two years is at least 90 credits Phil, 120 possible; 90 compulsory Phys, 30 something other than Phil (perhaps most likely physics). The joint honours project is an alternative to the physics or philosophy project.

BSc Joint Honours Computer Science and Physics

This degree programme runs as per the programme with Philosophy, but with most CS modules being 15 credits there is more flexibility in the arrangement of modules. Students are required to take 120 credits of CS modules over the two honours years.

MSci Joint Honours Chemistry and Physics

JH is normally entirely Chemistry modules. SH is as follows.

Quantum Mechanics 1 10	PH3061
Maths for Chem/Phys 20	PH3082
Solid State Physics 15	PH4039
Atomic, Nuc & Part Phys 15	PH4041

Thermal and Stat Phys 15	PH3012
Electromagnetism 15	PH3007
Quantum Mechanics 2 10	PH3062
Physics Lab 1 15	PH3101
Studies in Chem & Phys 5	PH4043

The final year of the MSci programme has a mix of CH and PH modules, including a choice of a physics or a chemistry project.

Joint Honours Mathematics and Physics / Theoretical Physics

These joint degree programmes have a restricted choice of physics modules within them in order to cover the core of physics. The choice within the mathematics half is wide. We illustrate some possible pathways for the joint degree programmes. Other pathways may be possible. Please note that PH3007 Electromagnetism should be taken in JH as it is a pre-requisite for Special Relativity and Fields. There are some topics that may be taken in either School, such as Group Theory and Fluids.

Junior Honours Physics/Theoretical Physics and (Pure) Mathematics

BSc Maths/Phys	MPhys Maths/TP
Quantum Mech 1	Quantum Mech 1
Comp Phys	Comp Phys
Maths for Phys (*instead of MT Diff Eq)*	Maths for Phys (*instead of MT Diff Eq)*
Linear Maths II	*Linear Maths II*
Real Analysis	*Real Analysis*

BSc Maths/Phys	MPhys Maths/TP
Quantum Mech 2	Quantum Mech 2
Electromagnetism	Electromagnetism
MT	Lag &Ham Dynam
Algebra	*Algebra*

Senior Honours Physics/Theoretical Physics and Mathematics

BSc Maths/Phys	MPhys Maths/TP
Nucl & Part Phys with Adv Skills 15	Nucl & Part Phys with Adv Skills 15
Solid State Phys 15	Solid State Phys 15
Maths Choices 15	Special Rel 15
Maths Choices 15	*Maths Choices 15*

BSc Maths/Phys	MPhys Maths/TP
Project – Maths 15 or Phys 30	Advanced QM 15
Thermal &Stat P 15	Thermal & Stat P 15
Choice 15	Choice 15
Choice 15/0	Choice 15

Junior Honours Physics/Theoretical Physics and (Applied) Mathematics

BSc Maths/Phys	MPhys Maths/TP
Quantum Mech 1	Quantum Mech 1
Comp Phys	Comp Phys
Linear Maths II	*Linear Maths II*
Diff Eqns	*Diff Eqns*
*Complex An**	*Complex An**

BSc Maths/Phys	MPhys Maths/TP
Quantum Mech 2	Quantum Mech 2
Electromagnetism	Electromagnetism
MT	Lag &Ham Dynam
*Tech Applied M **	*Tech Applied M **

*At least one of Complex Analysis and Techniques of Applied Maths is normally taken

Senior Honours Physics/Theoretical Physics and Mathematics

BSc Maths/Phys	***MPhys Maths/TP***
Nucl & Part Phys with Adv Skills 15	Nucl & Part Phys with Adv Skills 15
Solid State Phys 15	Solid State Phys 15
Maths Choices	Special Rel 15
Maths Choices	*Maths Choices*

BSc Maths/Phys	***MPhys Maths/TP***
Project – Maths 15 or Phys 30	Advanced QM 15
Thermal &Stat P 15	Thermal &Stat P 15
Choice 15	Choice 15
Choice 15/0	Choice 15

The joint honours project is an alternative project for joint degree BSc students.

For the BSc joint degree at least 100 credits must be from PH and/or AS honours modules, and at least 100 from MT honours modules. ID4001 taken in the respective school counts towards these totals. For the MPhys joint degree the same applies, but at least 145 credits are needed in each discipline.

The following tables aim to show the University's requirements for different degree programmes. The "normal" time to take a module is shown, but different arrangements may be possible. All programmes of study are subject to the approval of a student's adviser of studies. These tables should be consistent with the specifications in the University's module catalogue. Here we also state module names.

There is a general requirement to obtain at least 240 credits within a BSc honours programme, of which at least 90 credits are at 4000 level and at least a further 120 credits are at 3000 and/or 4000 levels. For MPhys and MSci degrees the honours programme must contain at least 360 credits, of which 120 area at 5000 level, and at least a further 210 credits are at 3000 and/or 4000 levels.

BSc Single Honours Degree in Astrophysics

Third Year	AS4010 Extragalactic Astronomy	15
	PH3061 Quantum Mechanics 1	10
	PH3081 Mathematics for Physicists	15
	PH3080 Computational Physics	10
	PH3014 Transferable Skills for Physicists	15
	AS3013 Computational Astrophysics	15
	PH3007 Electromagnetism	15
	PH3012 Thermal and Statistical Physics	15
	PH3062 Quantum Mechanics 2	10
Fourth Year	PH4041 Atomic, Nuclear and Particle Physics	15
	At least 30 credits from	
	AS4011 The Physics of Nebulae and Stars I	15
	AS4012 The Physics of Nebulae and Stars II	15
	AS4015 Gravitational and Accretion Physics	15
	AS4025 Observational Astrophysics	15
	PH4031 Fluids	15
	AS4103 BSc Project in Astrophysics	30
	Plus additional choice module, normally chosen from AS and PH modules and ID4001.	

BSc Single Honours Degree in Physics

Third Year	PH3061 Quantum Mechanics 1 PH3081 Mathematics for Physicists PH3080 Computational Physics PH3014 Transferable Skills for Physicists PH3007 Electromagnetism PH3012 Thermal and Statistical Physics PH3062 Quantum Mechanics 2 PH3101 Physics Laboratory 1 *Plus 15 credits of choice module*	10 15 10 15 15 15 10 15
Fourth Year	PH4041 Atomic, Nuclear and Particle Physics PH4039 Solid State Physics PH4105 Physics Laboratory 2 PH4111 BSc Project in Physics *Plus 40 credits of choice modules, normally chosen from relevant AS and PH modules and ID4001.*	15 15 15 30

BSc Joint Degrees - Physics and one of Computer Science and Logic & Philosophy of Science

Third Year	PH3061 Quantum Mechanics 1 PH3081 Mathematics for Physicists PH3080 Computational Physics PH3007 Electromagnetism PH3062 Quantum Mechanics 2 *Plus modules from the other subject*	10 15 10 15 10
Fourth Year	PH4040 Nuclear and Particle Physics with Adv. Skills PH3012 Thermal and Statistical Physics Either PH4111 BSc Project in Physics OR one of CS4098, PY4698, PY4699, joint degree project *Plus modules from the relevant subjects*	15 15 30

BSc Joint Degree - Physics and Mathematics

Third Year	PH3007 Electromagnetism	15
	PH3061 Quantum Mechanics 1	10
	PH3080 Computational Physics	10
	PH3062 Quantum Mechanics 2	10
	MT3501 Linear Mathematics	15
	For those with MT2502 and MT2505 ("pure" flavour)	
	PH3081 Mathematics for Physicists	15
	MT3502 Real Analysis	15
	MT3505 Algebra: Rings and Fields	15
	For those with MT2506 and MT2507 ("applied" flavour)	
	MT3504 Differential Equations	15
	One of	
	MT3503 Complex Analysis	15
	MT3506 Techniques of Applied Mathematics	
	Further credits if necessary to a total of ~120	
Fourth Year	PH3012 Thermal and Statistical Physics	15
	PH4040 Nuclear and Particle Physics with Adv. Skills	15
	PH4039 Solid State Physics	15
	One of	
	PH4111 Physics Project	30
	PH4796/MT4796 Joint Degree Project	30
	MT4599 Mathematics Project	15
	Further credits if necessary to a total of at least 240 over the honours programme. At least 90 credits must be at 4000 level. At least 100 credits must be from PH and/or AS modules, and at least 100 from MT modules. ID4001 taken in the respective school counts towards the totals for PH/AS or MT.	

MPhys Single Honours Degree in Astrophysics

Third Year	AS4010 Extragalactic Astronomy PH3061 Quantum Mechanics 1 PH3081 Mathematics for Physicists PH3080 Computational Physics PH3014 Transferable Skills for Physicists AS3013 Computational Astrophysics PH3007 Electromagnetism PH3012 Thermal and Statistical Physics PH3062 Quantum Mechanics 2	15 10 15 10 15 15 15 15 10
Fourth Year	AS4011 The Physics of Nebulae and Stars I PH4041 Atomic, Nuclear and Particle Physics AS4012 The Physics of Nebulae and Stars II PH4038 Lagrangian and Hamiltonian Dynamics 30 credits from AS4015 Gravitational and Accretion Physics AS4025 Observational Astrophysics PH4031 Fluids *Plus additional modules, normally chosen from AS and PH modules and ID4001to get 3rd & 4th year total to 240 credits*	15 15 15 15 30
Fifth Year	At least 30 credits from AS5001 Advanced Data Analysis AS5002 Magnetofluids and Space Plasmas AS5003 Contemporary Astrophysics AS5101 MPhys Astrophysics Project *Plus additional AS and PH credits to give a total of at least 120 level 5 credits.*	 15 15 15 60

MPhys Single Honours Degree in Physics

Third Year	PH3061 Quantum Mechanics 1 PH3081 Mathematics for Physicists PH3080 Computational Physics PH3074 Electronics PH3014 Transferable Skills for Physicists PH3007 Electromagnetism PH3012 Thermal and Statistical Physics PH3062 Quantum Mechanics 2 PH3101 Physics Laboratory 1	10 15 10 15 15 15 15 10 15
Fourth Year	PH4041 Atomic, Nuclear and Particle Physics PH4105 Physics Laboratory 2 PH4038 Lagrangian and Hamiltonian Dynamics PH4039 Solid State Physics *Plus choice modules, normally chosen from AS and PH modules and ID4001.*	15 15 15 15
MPhys Year	60 credits from PH and AS level 5 modules PH5101 MPhys Project	60 60

MPhys Single Honours Degree in Theoretical Physics

Third Year	PH3061 Quantum Mechanics 1 PH3081 Mathematics for Physicists PH3080 Computational Physics PH3014 Transferable Skills for Physicists PH3007 Electromagnetism PH3012 Thermal and Statistical Physics PH3062 Quantum Mechanics 2 PH4038 Lagrangian and Hamiltonian Dynamics MT3501 Linear Mathematics	10 15 10 15 15 15 10 15 15
Fourth Year	PH4041 Atomic, Nuclear and Particle Physics PH4032 Special Relativity and Fields PH4039 Solid State Physics PH4028 Advanced Quantum Mechanics *Plus choice modules, normally chosen from AS and PH modules and ID4001.*	15 15 15 15
MPhys Year	PH5004 Quantum Field Theory At least 15 credits from PH5002 Foundations of Quantum Mechanics PH5003 Group Theory PH5011 General Relativity PH5012 Quantum Optics PH5103 Project in Theoretical Physics *Plus choice modules to give at least 120 credits of level 5 modules, anticipated to be in PH and AS.*	15 15+ 60

MPhys Joint Degree – Mathematics and Theoretical Physics

Third Year	PH3007 Electromagnetism	15
	PH3061 Quantum Mechanics 1	10
	PH3062 Quantum Mechanics 2	10
	PH3080 Computational Physics	10
	PH4038 Lagrangian and Hamiltonian Dynamics	15
	MT3501 Linear Mathematics	15
	For those with MT2502 and MT2505 ("pure" flavour)	
	PH3081 Mathematics for Physicists	15
	MT3502 Real Analysis	15
	MT3505 Algebra: Rings and Fields	15
	For those with MT2506 and MT2507 ("applied" flavour)	
	MT3504 Differential Equations	15
	One of	
	MT3503 Complex Analysis	15
	MT3506 Techniques of Applied Mathematics	
	Further credits to a total of ~120	
Fourth Year	PH3012 Thermal and Statistical Physics	15
	PH4028 Advanced Quantum Mechanics	15
	PH4032 Special Relativity and Fields	15
	PH4039 Solid State Physics	15
	PH4040 Nuclear and Particle Physics with Adv Skills	15
	Further credits to a total of ~120 normally selected from MT, AS, PH, and ID4001 modules	
Fifth Year	At least one of	
	PH5002 Foundations of Quantum Mechanics	15
	PH5003 Group Theory	15
	PH5004 Quantum Field Theory	15
	PH5011 General Relativity	15
	PH5012 Quantum Optics	15
	Either	
	PH5103 MPhys Project in Theoretical Physics OR	60
	MT5999 Advanced Project in Mathematics/Statistics	40
	Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 -	

	and 5000 - level MT modules (except that 30 further credits from MT2000 - MT2999 may be substituted). Further credits if necessary to a total of at least 145 across Third, Fourth and Fifth Years from 3000 - , 4000 - and 5000 - level PH and AS modules (except that 15 further credits from a physics-based ID4001 may be substituted). *In total, at least 330 credits must be achieved at 3000, 4000 and 5000 level with at least 120 of these at 5000 level.*	

MSci Joint Honours Degree in Physics and Chemistry

Students spend third year taking the Chemistry component of level three and four modules, and fourth year taking the Physics component.

Third Year	CH3431 Chemistry Workshop CH3441 Mini Chemistry Project CH3512 Organometallic Chemistry CH3514 Physical Inorganic Chemistry CH3615 Mechanism in Organic Chemistry CH3712 Quantum Theory of Atoms, Molecules, and Solids CH3717 Statistical Mechanics and Computational Chem. CH3721 Physical Chemistry Laboratory CH4715 Functional Materials & Electrons in Solids CH4716 Electrochemistry and Computational Chemistry CH4717 Fund. of the Spectroscopy of Molecules & Solids	
Fourth Year	PH3061 Quantum Mechanics 1 PH3082 Mathematics for Physics/Chemistry PH4039 Solid State Physics PH4041 Atomic, Nuclear and Particle Physics PH3007 Electromagnetism PH3012 Thermal and Statistical Physics PH3062 Quantum Mechanics 2 PH3101 Physics Laboratory 1 PH4043 Studies in Chemistry and Physics	10 20 15 15 15 15 10 15 5
MPhys Year	EITHER PH5101 MPhys Physics Project (60 credits) 15 further credits in level 5 PH modules 30 credits in three of CH5518, CH5711-5715, CH5717 *15 further credits from relevant level 5 CH and PH modules* OR CH5441 Chemistry Project (50 credits) 30 credits of level 5 PH modules 30 credits from CH5518, CH5711-5715, CH5717 *10 further credits from relevant level 5 CH and PH modules*	

Disclaimer:- *Some of the arrangements detailed in this booklet may have to be changed, and there may be errors. The School will endeavor to notify registered students of any significant updates to this document. The University's centrally published regulations will normally take precedence in any disagreement with matters stated in this handbook. If you become aware of any disagreement, please consult with Bruce Sinclair as soon as possible. BDS 22.8.16*