Term Dates

Autumn Term

**Monday 19 September 2016 – Friday 9 December 2016**

New Students: Induction 19 September – 23 September 2016
Returning Students: 22 September – 23 September 2016
First day of lecturing Monday 26 September 2016
Last day of lecturing Friday 9 December 2016

Spring Term

**Monday 9 January 2017 – Friday 24 March 2017**

First day of lecturing Monday 9 January 2017
Last day of lecturing Friday 24 March 2017

Summer Term

**Monday 24 April 2017 – Friday 9 June 2017**

Fourth year MSci teaching dates may be different; see the MSci Handbook.

Graduation Ceremonies Monday 10 – Friday 14 July 2017

Disclaimer

This document was published in September 2016 and was correct at that time. The Department* reserves the right to modify any statement if necessary, make variations to the content or methods of delivery of programmes of study, to discontinue programmes, or merge or combine programmes if such actions are reasonably considered to be necessary by the College. Every effort will be made to keep disruption to a minimum, and to give as much notice as possible.

* Please note, the term ‘Department’ is used to refer to both ‘Departments’ ‘Centre’s’ and ‘Schools’. Students on joint or combined degree programmes will need to use two departmental handbooks.

An electronic copy of this handbook can be found on your Departmental website (http://www.rhul.ac.uk/physics/informationforcurrentstudents/home.aspx) where it will be possible to follow the hyperlinks to relevant webpages.
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1 Introduction to the Department

1.1 Welcome

A warm welcome to the Department of Physics. The MSc in Physics Euromasters Student Handbook (this document) is the main source of information and advice provided by each department in the College to its own students. In the following pages you should find all of the essential information that a student studying for a Euromasters degree in the Department of Physics should need. Web links to further sources are also listed.

The handbook should be read in full by every Euromasters student of Physics. You will find you need to become very familiar with some of the information for use on a day to day basis. Other information will not be needed anywhere near as frequently and you will simply need to recall that its source is the MSc in Physics Euromasters Student Handbook, referring back as and when questions arise, so please store this document in a safe place after you have read it. An up to date electronic version can be found on the Departmental web site. We are aware that the reading of this document will take some time so, without loss of accuracy or completeness, we have endeavored to be as succinct as possible.

Please do not hesitate to ask questions of academic or departmental office staff, but first please ensure that you have referred to this handbook. If you spot any errors or there is any need for clarification please let the office staff know. While we have made every effort to ensure that such events are rare, we are not infallible.

I hope you very much enjoy the coming academic year, we aim to make it as fulfilling as possible.

Professor Jon Goff
Director of Graduate Studies

1.2 How to find us: the Department

The Physics Department is housed in the Tolansky (room numbers Txxx) and Wilson (Wxxx) Laboratories. This can be found on the College campus map as buildings 21 and 22. Most of the academic, research, technical and administrative staff are based here. The first number of the room code denotes the floor level, 0, 1, or 2.

Student parking is limited and a parking permit is required. This can be obtained via Security. You will need proof of insurance and ID before a permit will be issued.

1.3 How to find us: the staff

A listing of academic, administrative, research and technical staff by area of responsibility and their contact details can be found in Appendix 5. A listing of all teaching staff and their contact details is given in Appendix 6.
1.4 How to find us: the Departmental Office

The Departmental Office can be found in T114, Tolansky Building.
The principal departmental telephone number is: 01784 443506.
The generic departmental email address is: Physics@rhul.ac.uk.
The Euromasters Administrator can be found in T114, Tel: 01784 276265.

A current staff directory can be found at https://www.royalholloway.ac.uk/physics/staffdirectory/home.aspx

Key contacts:

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Office</th>
<th>Telephone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of Department</td>
<td>Prof Pedro Teixiera-Dias</td>
<td>T116, Tolansky</td>
<td>01784443453</td>
<td><a href="mailto:Pedro.teixeira-dias@rhul.ac.uk">Pedro.teixeira-dias@rhul.ac.uk</a></td>
</tr>
<tr>
<td>Director of Graduate Studies</td>
<td>Prof Jon Goff</td>
<td>W051, Wilson</td>
<td>01784443485</td>
<td><a href="mailto:Jon.goff@rhul.ac.uk">Jon.goff@rhul.ac.uk</a></td>
</tr>
<tr>
<td>Postgraduate Administrator</td>
<td>Ms Carmela Froggatt</td>
<td>T114, Tolansky</td>
<td>01784276265</td>
<td><a href="mailto:Carmela.froggatt@rhul.ac.uk">Carmela.froggatt@rhul.ac.uk</a></td>
</tr>
<tr>
<td>Department Manager</td>
<td>Mrs Tracy Webster</td>
<td>T115, Tolansky</td>
<td>01784443448</td>
<td><a href="mailto:Tracy.Webster@rhul.ac.uk">Tracy.Webster@rhul.ac.uk</a></td>
</tr>
</tbody>
</table>

1.5 The Department: practical information

The following notes provide information of a general nature about security and safety within the Department.

**Normal Hours.** The Department is normally open Monday to Friday 08.30 to 17.00 and closed at weekends and public holidays. Outside normal hours all external doors are locked. Undergraduates are allowed in the Department outside normal hours only under supervision.

**Fire Procedure.** Fire Regulations are posted in the Department. Staff and students should familiarise themselves with these and with the fire alarm system, the evacuation procedure and assembly point 12 on the corner near the Physics Workshops. Fire Wardens are appointed for each floor and building. In the event of a bomb scare, evacuation procedures are as for a fire drill.

**First Aid.** First Aid Boxes are provided in the Department. Staff and students should be aware of their location. Qualified First Aiders are listed near these boxes and in Appendix 1. Outside normal hours dial 444 from any phone in the Department and ask for assistance.

**Smoking.** The Department follows the College No Smoking Policy. Smoking is not allowed anywhere in the Department or within 5 metres of the building.

**Eating and Drinking.** The Department has a kitchen in T132 for the preparation of drinks. Food (small meals and snacks) and drinks may be prepared and consumed in T132/T118. Food and drinks are not allowed anywhere else in the building, especially in laboratories or workshops.

**Safety.** It is important that you are safe in the laboratory at all times. You must
become familiar with safety procedures and safe working practices must be followed at all times. In particular you are not allowed into research laboratories unless supervised by a member of staff. Everyone, including you, has a legal duty to ensure the safety of yourself and others. The Head of Department has appointed a Safety Officer, a Deputy Safety Officer and a Radiation Supervisor to advise and assist him in safety matters. Risk Assessments will have been carried out for all work in teaching laboratories, research laboratories and workshops.

**Ionising Radiation.** Work with ionising radiation is only permitted when approved by the Departmental Radiation Protection Supervisor and the College Safety Officer. All work must conform to the Royal Holloway Site Rules and the Physics Department Local Rules for Work with Ionising Radiation.

**Accident Reports.** All accidents involving injury must be reported to the College Safety Officer by the senior person on site within 24 hours of any occurrence via an Accident Report Form. First Aiders and the Departmental Safety Officer have these forms and will usually be required to complete them.

**Out of Hours Working.** Experimental work is not permitted outside normal hours if it involves working alone.

**Dangerous Incidents.** Events that give rise to a situation involving the possibility of an accident, even though no harm in fact occurs, must be reported to the Safety Officer.

**Laser Pointers.** Students must not use or keep their own laser equipment on College premises. If a student requires a laser pointer for use during a presentation, the Department can supply one.

## 2 Communication

It is vitally important that you keep in touch with us and we keep in touch with you. Members of staff will often need to be able to contact you to inform you about changes to teaching arrangements, special preparations you may have to do for a class or meetings you might be required to attend. You will need to be able to contact members of the Department for example, if you are unable to attend a class, or wish to arrange a meeting with your Personal Adviser.

Email to your College email address is routinely used and **you should check regularly** (at least daily) if any official communication has been sent to your email address. **Do not** ignore the email as it will be assumed that it will have been received by you within 48 hours, excluding Saturdays and Sundays.

You should also make a habit of checking the student pigeonholes in the Department.

### 2.1 Email

The College provides an email address for all students free of charge and stores the address in a College email directory (the Global Address List). Your account is easily accessed, both on and off campus, via the **student portal** [https://campus-connect.rhul.ac.uk/cp/home/displaylogin](https://campus-connect.rhul.ac.uk/cp/home/displaylogin) (Campus Connect) or direct via [Outlook.com](http://outlook.com/). **Email to this address will be used routinely for all communication with students.** Email may be used for urgent communication and by
course tutors to give or confirm instructions or information related to teaching so it is important that you build into your routine that you **check your emails once a day**. Email communications from staff and all the Faculty Administrators should be treated as important and read carefully.

The College provides a number of PC Labs around Campus for student use, and you can also use your own laptop/smart phone etc, so the Department expects you to check your email regularly. It is also important that you regularly clear your College account of unwanted messages or your in-box may become full and unable to accept messages. **Just deleting messages is not sufficient; you must clear the ‘Sent Items’ and ‘Deleted Items’ folders regularly.** It is your responsibility to make sure your College email account is kept in working order. If you have any problems contact the [IT Service Desk](http://itservicedesk.rhul.ac.uk/).

The Physics Department will only use the address in the College Global Address List and **does not** use private or commercial email addresses, such as hotmail or Gmail. Students who prefer to use commercial email services are responsible for making sure that their College email is diverted/forwarded to the appropriate commercial address. Detailed instructions on **how to forward mail** can be accessed by visiting [http://help.outlook.com/](http://help.outlook.com/) and searching for **forwarding**. This process is very easy, but you do have to maintain your College account. When you delete a forwarded message from, say, hotmail, it will not be deleted from the Royal Holloway account. **It is your responsibility to log on to your College account occasionally and conduct some account maintenance or your account may become full and therefore will not forward messages.**

If you send an email to a member of staff in the Department during term time you should normally receive a reply within 3-4 working days of its receipt. Please remember that there are times when members of staff are away from College at conferences or undertaking research.

**2.2 Post**

All post addressed to postgraduate students in the Physics Department is delivered to the student pigeonholes in the post room, T128. At the end of each term student pigeonholes are cleared of accumulated mail which is then destroyed. Important information from Registry is often sent by internal post and tutors sometimes return work to you via the pigeonholes so you are advised to check them regularly.

**2.3 Telephone and postal address**

It is **your responsibility** to ensure that your telephone number (mobile and landline) and postal address (term-time and forwarding) are kept up to date on the [student portal](https://campus-connect.rhul.ac.uk/cp/home/displaylogin). There are occasions when the Department needs to contact you urgently by telephone or send you a letter by post.

The Department does not disclose students’ addresses and telephone numbers to anybody else (including relatives and fellow students) without the student’s specific permission to do so.
2.4 Mobile phones
As a common courtesy to both teaching staff and your fellow students, you should keep mobile phones turned off during formal teaching periods.

2.5 IT Services
The College IT Service Desk https://www.royalholloway.ac.uk/it/home.aspx offers a range of support covering all aspects of IT services, such as email access, connecting to the College’s wireless network, connecting devices such as iPads and making use of College printing facilities.

The IT Service Desk will also be able to provide expert advice and guidance on a range of more specific IT issues, should you experience any problems. They also offer a range of free software, including Microsoft 365, NVivo and SPSS. For more information visit their website at https://www.royalholloway.ac.uk/it/studentpurchasing.aspx.

2.6 Notice boards
The official student notice boards are on the walls outside the Tolansky Teaching Laboratory, T231. Every effort is made to post notices relating to class times etc well in advance, but occasionally changes have to be made at short notice and in that case email will be used.

It is your responsibility to check the times and venues of all class meetings and of any requirements (eg. essay deadlines) relating to your courses.

3 Teaching

3.1 Dates of terms
Term dates can be found on the College website http://www.royalholloway.ac.uk/aboutus/collegecalendar/home.aspx

The term dates for intercollegiate lectures are as follows:
Autumn Term: Monday 26 September – Friday 9 December 2016
Spring Term: Monday 9 January – Friday 24 March 2017
Revision Week: Monday 24 April – Friday 28 April 2017
Examination Period Tuesday 2 May – Friday 26 May 2017

You are expected to be in the UK and engaging with your studies during term time. In the case of an emergency which requires you to leave the country and/ or miss lectures/ seminars/ practical’s etc., you are expected to keep your department informed and fill in a Notification of Absence Form (see attendance requirements). During the summer term, after the summer examination period, you are expected to attend all required academic activities organized by your department(s) and to be available should you be required to meet with College staff for any reason.
3.2 Attending classes and engaging with your studies

The College has a responsibility to ensure that all students are attending regularly and progressing with their studies. While it is essential that you attend all the compulsory learning activities related to your programme of study, the College recognises that emergencies may occur at any time throughout the year. In light of this, the Physics Department has set a minimum attendance level at 75%. You should be aware that you may also study courses that have different and specific course attendance requirements, particularly if you are taking courses in another department, so it is essential that you check all programme and course handbooks to ensure you are fully aware of the requirements.

Your regular attendance in class and consistent engagement with your studies are fundamental requirements of your learning experience with the College. As such, failure to attend and/or absence without permission can result in serious consequences and may lead to disciplinary action, including the termination of your registration (see 3.2.6 below). Your ‘classes’ are any learning or teaching activity deemed essential to your programme of study. The term is used to encompass a variety of different activities, including lectures, seminars, tutorials, workshops, field work, laboratory work, and meetings your Personal Advisor.

It is vital that you manage your time effectively, so that any paid employment, voluntary work, extracurricular activities or social commitments do not interfere with periods where you are required to attend classes. With regard to paid employment during the course of your programme of study with the College, the Postgraduate Taught Regulations (http://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.aspx) stipulate that the amount of paid work undertaken by a student enrolled with the College on a full-time basis shall not exceed 20 hours per week during term time. No student may undertake paid work which may conflict with his/her responsibilities as a student of the College.

If you face difficulty in attending any classes or undertaking an assessment it is very important that you inform the department(s) in which you are studying as early as possible, citing the reasons for your non-attendance. The department will make a decision on whether or not to authorize your absence. If you are experiencing such difficulties on an ongoing basis, please contact your Personal Adviser or Year Tutor. In addition, an extensive range of additional support, guidance and advice is readily available from the College’s Student Advisory Service (https://www.royalholloway.ac.uk/ecampus/welfare/home.aspx). The Students’ Union also operate an Advice and Support Centre, details on which can be found here http://www.su.rhul.ac.uk/advice/.

3.2.1 Your responsibilities in relation to attendance

Your responsibilities around attendance and engagement include:

- attending all classes necessary for the pursuit of your studies (including lectures, seminars, practicals and personal tutorials);
- undertaking all summative and formative assessment requirements for your courses;
• attending all meetings and other activities as required by the department(s) in which you are studying;
• where you experience any form of difficulty in attending classes, for whatever reason, contacting the department(s) in which you are studying to notify them of your circumstances at the earliest possibility.

You are expected to fully engage in your classes, undertaking any reading, research or further preparation identified between these sessions alongside punctual attendance. It is essential that you make suitable arrangements for travel to your classes and plan to arrive in good time, as teaching will start at five minutes past the hour and finish five minutes before the hour. You will normally be marked absent if you turn up late without good reason.

**It is your responsibility to be aware of the times and venues of all teaching sessions and of any requirements (e.g. deadlines) relating to your courses.**

### 3.2.2 Departments’ responsibilities for monitoring attendance

The **Physics Department** will monitor your attendance at lectures, labs, tutorials etc. It is your responsibility to complete any attendance register that is circulated and to make sure that your attendance has been noted. The activities at which your attendance is monitored may vary depending upon the discipline in which you are studying or the department in which you are taking courses in the case of electives, for example.

You should sign in using your full signature, not just initials. Please note that you are not permitted to ask fellow students to sign the attendance register on your behalf if you cannot attend.

It is important that you attend all the learning activities related to your programme of study. Whilst attendance is compulsory at all learning activities, it is recognised that emergencies may occur at any time throughout the year and therefore as indicated above a minimum attendance requirement has been set.

You will be contacted in the event that:

1. **you fail to attend for two weeks** without providing notification of your absence;
2. **you display a pattern of absence** that the department feel is affecting or is likely to affect your work
3. **you display a pattern of absence** that the department feel is a cause for concern over your wellbeing or may point to a disability which you may not have disclosed.

### 3.2.3 College’s responsibilities for monitoring attendance

The **College** has a number of important obligations in relation to monitoring your attendance and engagement, including legal responsibilities under the **Equality Act (2010)**. As a result, the College may adjust the attendance requirement for your programme but will only do this when such adjustment does not compromise competence standards or your ability to reach the learning outcomes of your programme. Any need to adjust attendance requirements will be treated case by case.
case and discussed by the department with the Disability and Dyslexia Services (DDS) and Academic Quality & Policy Office (AQPO).

The College also has obligations placed on it by UK Visas and Immigration (UKVI) – (see 3.2.7 below – Withdrawal of Visa).

3.2.4 Missing classes

If you are unable to attend College for whatever reason you must advise the department in which you taking the course(s) in question and complete the relevant Notification of Absence Form, which is available online.

https://www.royalholloway.ac.uk/ecampus/academicsupport/attendance/notificationofabsence.aspx

![Notification of Absence Form - Absence Due to Illness](https://www.royalholloway.ac.uk/ecampus/academicsupport/attendance/notificationofabsence.aspx)

**Figure 1 - Notification of Absence Form – Absence Due to Illness**

This must be submitted to the relevant department(s) together with the relevant supporting documentation either before your absence or within five working days of the end of the period of absence.

You should ensure:

a. complete the appropriate Notification of Absence Form available from ecampus on the Forms and Supporting Evidence tab on
b. that you submit the paperwork to your department(s) either before your absence or within FIVE working days of the end of the period of absence. Failure to do so may result in the absence being counted as unacceptable and counting against the minimum attendance level. The form should be signed by your Personal Adviser and then handed into the Departmental Office.

c. take all necessary steps to catch up with any missed work.

Please note that filling in a Notification of Absence Form does not mean that your absence will be excused. It is your responsibility to follow up with your department to check whether or not your absence has been deemed acceptable (excused) or unacceptable (not excused).

This table shows the documentation that is required should you be absent for any reason.

<table>
<thead>
<tr>
<th>Reason for absence</th>
<th>Documentation required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness up to and including 5 consecutive term-time days (excluding Saturdays and Sundays)</td>
<td>Completed Notification of Absence Form – Self Certification</td>
</tr>
<tr>
<td>Illness for more than 5 consecutive term-time days (excluding Saturdays and Sundays)</td>
<td>Completed Notification of Absence Form - Self Certification plus Formal Medical Certification signed by the Health Centre, your GP or hospital consultant</td>
</tr>
<tr>
<td>Unrelated to sickness</td>
<td>Notification of Absence Form plus supporting evidence</td>
</tr>
<tr>
<td>Leave of absence request</td>
<td>Notification of Absence Form plus any departmental requirement must be met</td>
</tr>
</tbody>
</table>

Note:
- If you are absent for a prolonged period it is essential that you keep in touch with the Department (e.g. through regular emails with your Personal Advisor or the Departmental Office). Depending on the length of absence it may be in your best interests to interrupt your studies and return once you are able to fully engage with your studies.
- The Department will monitor the frequency of self-certified absences and the Head of Department may request a doctor’s medical certificate from you in the event of multiple and/or sustained instances of self-certified illness.
- The departments in which you are studying are responsible for monitoring your attendance and engagement, and deciding whether a period of absence is deemed acceptable or unacceptable (for further information please refer to the online guidance http://www.rhul.ac.uk/ecampus/academicsupport/attendance/notificationofabsence.aspx for details of what constitutes ‘acceptable’ and ‘unacceptable’ circumstances relating to absence). If deemed unacceptable the absence will be recorded as such and will count against your minimum attendance level.
3.2.5 Missing an examination

In the event that you are unable to attend an exam (e.g. through reasons of sudden illness), it is essential that you notify Student Administration at the very earliest possibility. Wherever possible, please try to ensure you contact them via e-mail at student-administration@rhul.ac.uk before the scheduled start of the exam with your name, student ID and confirmation of the exam that you are unable to attend. Please include a brief explanation within the email outlining the reasons for the non-attendance.

This notification will then be forwarded by Student Administration to your department so that they are aware of your non-attendance.

Please note, this notification is not a substitute for formally notifying your department of Extenuating Circumstances. It is essential that you inform your department and Chair of the Sub-board of Examiners by completing the Extenuating Circumstances form. For further information, please refer to the website https://www.royalholloway.ac.uk/ecampus/academicsupport/examinations/extenuatingcircumstances.aspx.

In the event that you do not complete the Extenuating Circumstances form, your department will be unable to consider the reasons for your non-attendance at your departmental Sub-Board of Examiners.

3.2.6 Consequences of failing to attend

As indicated in 3.2.2 above the Department may contact you if there are concerns about your attendance

Lack of attendance, in particular poor lecture attendance, is a leading indicator of a failing student. For this reason and for others, including pastoral care, we have strict processes for monitoring attendance.

The Department of Physics takes the matter of course attendance and the submission of coursework very seriously. Your attendance and coursework submissions are continuously monitored by the Year Tutors and the Senior Tutor. If you are absent from teaching sessions without good reason the Department will automatically contact you to ensure that you are safe and well and to request an explanation. Failure to respond, or further absence, is a serious matter.

Should it become apparent that there are no acceptable reasons for your non-attendance, non-submission of coursework and/or general lack of engagement with your studies, the Department will initially send an email warning from the Senior Tutor, and then if there is no improvement, a first Formal Warning Letter from the Head of Department will be issued. This forms the first stage of the procedure for terminating your registration and it remains on file. You should arrange to meet with the Senior Tutor to discuss the situation. Further problems with attendance and submitted work will trigger a Second Formal Warning Letter which can escalate to the termination of your registration at the College. You are strongly advised to read the guidance on the formal warning process and the consequences of receiving

In situations where you are experiencing documented severe difficulties the Department and College will make every effort to support you and counsel you as to the best course of action. However, there may be cases where, although non-attendance is explained by an acceptable reason, your level of attendance falls to a level which compromises educational standards and/or your ability to reach the learning outcomes of the course. In such cases it will be necessary to implement disciplinary procedures as detailed above.

3.2.7 Withdrawal of visa

If you are in receipt of a Tier-4 (General) Student Visa sponsored by Royal Holloway, it is a requirement of your Visa that you attend classes and complete assessments. This is also a requirement of the College’s academic regulations. The College has a legal responsibility to report any student admitted to the College on a student visa who does not appear to be in attendance to UK Visas and Immigration (UKVI). Therefore if you fail to meet UKVI visa requirements and/or fail to respond to informal and formal warnings from the College in this regard you could have your sponsorship withdrawn, your Visa cancelled and your registration with the College terminated. The termination of registration due to a breach in Visa requirements is conducted independently of the College’s formal warning process and the decision is not open to appeal.

Please see the College Postgraduate Taught Regulations (http://www.rhul.ac.uk/ecampus/academicsupport/regulations/home.aspx).

3.3 Meetings

You are likely to be invited to meet with a member of academic staff in your department:

- if you fail to attend all learning activities in two consecutive weeks without providing an explanation
- where your pattern of absences is:
  - considered to be having an effect on your work or causing concern for your well being
  - pointing to a possible disability that you may not have disclosed
  - where your attendance is approaching the minimum attendance level

You should take any meeting invitation seriously. If you should have problems you are being offered an opportunity to seek advice and assistance. At the meeting the Department’s expectation of you will be made clear and the formal disciplinary process will be outlined to you.
4 Degree Structure

Full details about your programme of study, including, amongst others, the aims, learning outcomes to be achieved on completion, courses which make up the programme and any programme-specific regulations are set out in the programme specification available through http://www.royalholloway.ac.uk/coursecatalogue/home.aspx or http://www.royalholloway.ac.uk/studyhere/progspecs/home.aspx

The programme consists of a taught first year, which incorporates a significant research project and research skills training element. This is followed by a research year at Royal Holloway, with a choice of research training courses. Alternatively the possibility exists to transfer to a SEPnet partner at the end of year 1.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Lecture courses</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taught year</td>
<td>(Advanced) Quantum Theory</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>Choice of five other courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project (including key skills training)</td>
<td>37.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

The Project in year 1 is in a research area of a member of academic staff in the Department. The lecture courses are selected from the current list given in Appendix 1 in consultation with the Programme Director.

The Research Project in year 2 is also supervised by a member of academic staff in the Department. Research training courses are listed below.

The Programme Director is Prof. Jon Goff who also acts as the Director of Graduate Studies in the Department of Physics. The Programme Director will help you with any difficulties you may have and he may advise you on deferral or interruption of your studies.

The programme lasts for two years, with each year comprising 60 ECTS, individual lecture courses are 7.5 ECTS.

The First Year

In your first year you will take six taught courses, including usually PH5226 Advanced Quantum Theory.

The first year courses are taught by members of the University of London intercollegiate MSci consortium. The current course list is given in Appendix 1; in any year this can change with courses withdrawn and new ones introduced. The definitive list, with course details, is given in the Intercollegiate MSci Handbook. The undergraduate MSci course codes are in the format PH4xxx. MSci courses taken by postgraduate students have a course code in the format PH5xxx (eg PH4211 Statistical Mechanics as listed in the MSci Handbook becomes PH5211 when taken as part of the Euromasters programme). The course choice should be made before the beginning of the programme with advice from the Programme Director. There is a written examination associated with each lecture course, taken in the summer term at Royal Holloway. The timetable for the examinations is published.
towards the end of the spring term.

**The Second Year**
In the second year you will conduct a Research Project PH5500 (60 ECTS). Associated with this, you may take a series of specialist research training courses.

**Research Training**
In your second year, as part of your Research Project, you may participate in research training on topics related to the project, through directed study, seminars and lectures. There will be no formal examinations in these courses. Progress will be assessed by coursework and seminar participation.

4.1 Course registrations
While you have the option of changing course unit registrations within the first two weeks after the start of teaching (excluding Welcome Week) subject to agreement from the department, once you have submitted assessment for the course, you may not replace it with another either in that term or in a subsequent term (e.g. Spring term). Any courses that you wish to take on an extracurricular basis (that is, as extra and not counting towards your degree) must be identified at the start of the academic year or before any assessment has been completed for the course.

5 Facilities

5.1 Libraries
There are 2 libraries on campus:

- **Founder’s Library**, located on the South Side of Founder’s Building, houses most language, literature, film, music and theatre material;
- **Bedford Library**, located up the hill from the Students’ Union next to the History Department, houses science, social science and history material;

Details, including further resources available, opening times and regulations, can be found online: [http://www.royalholloway.ac.uk/library/home.aspx](http://www.royalholloway.ac.uk/library/home.aspx)

Phone: 01784 443823
Email: Library@rhul.ac.uk
Website: [https://www.royalholloway.ac.uk/library/home.aspx](https://www.royalholloway.ac.uk/library/home.aspx)

The Library Service provides access to a variety of resources including books, e-journals, e-books and databases. Details of resources, along with opening times and regulations can be found at [https://www.royalholloway.ac.uk/library/informationforpostgraduates.aspx](https://www.royalholloway.ac.uk/library/informationforpostgraduates.aspx).

The Information Consultant for your Department is Leanne Workman who can be contacted at [leanne.workman@rhul.ac.uk](mailto:leanne.workman@rhul.ac.uk).

If you cannot find the specific items that you require in the libraries, it is possible to
order items from other libraries by inter-library loans
https://www.royalholloway.ac.uk/library/usingourlibraries/interlibraryloans.aspx

You will also have access to the following libraries:

- **Senate House Library** (Malet Street, London, WC1E 7HU. Tel: 020 7862 8461; http://www.ull.ac.uk). This is the central library http://www.senatehouselibrary.ac.uk/membership of the University of London, where you can borrow up to twelve books with a library ticket (http://www.senatehouselibrary.ac.uk/membership/join/) which you can obtain using your RHUL College ID card.

- **The British Library** (96 Euston Road, London, NW1 2DB. Tel: 020 7412 7000; http://www.bl.uk). The British Library is the national collection and holds copies of all books published in the UK and Ireland, alongside an extensive collection from other countries. It also has an impressive collection of medieval and modern manuscripts. A Reader Pass http://www.bl.uk/help/how-to-get-a-reader-pass will be issued subject to your need to see specific items in the collections. Other libraries or sources may be more appropriate to your research and British Library staff will advise you accordingly. Further information is available online via http://www.bl.uk/reshelp/inrooms/stp/refteam/refteam.html.

- **SCONUL Access Scheme** Royal Holloway participates in this national university access scheme which allows student to use other university libraries in the UK. Details of the application process can be found at: https://www.royalholloway.ac.uk/library/usingourlibraries/otherlibraries/sconulaccess.aspx

If you cannot find the specific items that you require in the libraries, it is possible to order items from other libraries by inter-library loan or to gain access to the Senate House Library or other university libraries. You can obtain further information on this by asking at the library helpdesks. The Information Consultant for Physics is Leanne Workman, who can be contacted at Leanne.workman@rhul.ac.uk

The Library provides a range of training sessions designed to enhance your existing library and research skills. These are available in both class-based and self-study formats. For information on available sessions and to book a place, go to: https://www.royalholloway.ac.uk/library/helpandsupport/helpandsupport.aspx

**5.2 Physics Resources Room (T118)**

In addition to the books available in the Bedford Library, the Department provides some books for physics students in the Physics Resources Room in T118. This is not a formal library so the stock held there is limited. It is not meant to be a replacement for the Bedford library but merely an additional option for your studies. **You must not remove any text books from T118.** The Resources Room (T118) is available to all members of the Department. A range of learning materials including a selection of the recommended textbooks, and study seating is provided. Various periodicals including *New Scientist* and *Scientific American* are also made available to read. A small number of PCs are available for general use. The Resources Room must be kept clean and tidy. Occasionally the room is made unavailable to students during departmental meetings and other functions.
There are facilities for making hot drinks in T132 and these may be consumed in the Resources Room. This area is available for students to use on condition that it is kept clean and tidy. There is a soft drinks dispenser on the ground floor foyer of Wilson and a chilled water dispenser in T118.

6 Photocopying, printing and computing

6.1 Photocopying

The departmental photocopier is in constant use by office staff and lecturers. For this reason, we are unable to allow students to use it. Instead you can use copier-printers (MFDs) located in the libraries, the Computer Centre and many PC labs, which will allow you to make copies in either black and white or colour. Further information is available online: https://www.royalholloway.ac.uk/it/printing/home.aspx

6.2 Printing

Many of the PC labs are open 24 hours a day, 7 days a week. Alternatively, there are computers available for your use in the libraries and Computer Centre.

Departmental staff are unable, in any circumstances, to print anything out on your behalf. Copier-printers (MFDs) are located across the campus in the PC labs, libraries and Computer Centre. Further information on printing is available online: http://www.royalholloway.ac.uk/it/printing/home.aspx

6.3 Computing

The Computer Centre provides a range of IT training sessions designed to enhance your current IT skills. These are available in both class-based and self-study formats, and successful completion of the course is rewarded by a College IT Skills certificate. To participate in these sessions, go to: http://www.royalholloway.ac.uk/it/training/home.aspx

A suite of PCs is also located in the teaching laboratory. These computers are used for many courses. When not timetabled for use in teaching, they are available for general use but may not be used for playing games etc.

6.4 Lockers

Lockers are provided for your use on the second floor of the Tolansky Building opposite the lift. These lockers are intended for daily use and not for overnight storage. To use a locker, open one with a key in the door, insert £1 in the slot inside the door, close the door and remove the key. The £1 is returned when the key is returned to the locker. For the sake of subsequent users, please ensure that lockers are left clean and dry.

No guarantee of security or insurance is provided and the Department retains the right to open any locker and remove and dispose of the contents.

Contact the technicians in the Teaching Laboratory if you lose a locker key or if the
Department has removed the contents. Proof of ownership of the contents will be required in either case and it is, therefore, strongly recommended that your name or other means of identification be stored with the contents.

6.5 Telescopes
The four-metre dome on top of the Wilson Building houses the Department’s telescope – a 12inch Schmidt-Cassegrain computerised f/10 telescope. Depending on weather conditions, regular sessions are organised by the Physics Society to observe objects such as planets, multiple star systems, galaxies, galactic clusters, and globular clusters. Students wishing to use the telescope should, in the first instance, consult the Astrophysics Course Director.

6.6 Mathematica
Extensive use is made of the Mathematica software system in several of our courses. Mathematica is available on the College PC network, including the PCs in Tolansky, for you to use for your studies and coursework. As a Royal Holloway student it is possible for you to install a copy of Mathematica on your own computer. Free to download until 2017 from http://www.royalholloway.ac.uk/it/studentpurchasing.aspx

6.7 Colloquia
The Department organises a regular programme of colloquia - talks given about topics in Physics outside the normal degree programmes and intended to broaden the knowledge of us all. Staff in the Department (including postdoctoral fellows and PhD students) give some, external speakers give others. The level varies but most should be intelligible to final year undergraduate students. They are frequently an excellent source of careers information. They are normally accompanied by tea and biscuits in the Common Room. Details are emailed and advertised on noticeboards. All research students are expected to attend all Departmental Colloquia.

7 Seminars, Coursework and Projects

7.1 Seminars, colloquia and guest lectures
The Department holds a regular series of colloquia and seminars on important research topics, as well as ad hoc seminars given by short stay visitors. Students are encouraged to attend these.

Throughout the programme a number of guest lecturers will be arranged. These will include lectures from external organisations, such as Oxford Instruments plc, the National Physical Laboratory, the Rutherford-Appleton Laboratory and CERN. Students will be expected to attend these.

7.2 Coursework
Most courses will have an element of coursework, which will contribute to the assessment. All coursework should be submitted by the specified deadline. Examinations for the taught courses are held in the summer term at Royal Holloway.
These papers test knowledge and understanding of each course and the ability to apply the material, e.g. by carrying out related calculations.

### 7.3 The 1st year Project

This project, PH5100, will occupy some 25% of your first year. The project is in a research area of a member of academic staff in the Department, who will supervise the work, define what is expected, advise on background literature and what skills are to be developed. This project should prepare you for the more extensive research project in your second year. A one-page progress report must be submitted and a progress meeting held with the Programme Director by the end of November. The purpose of this short report is to ensure that the scope of the project is well defined and that a suitable work plan is in place. The experimental, theoretical or computational work should be completed in good time to ensure that the report can be submitted by the deadline of the end of the spring term.

**Word count**

The length of the report should be between 7,000 and 10,000 words. All over-length work submitted will be penalised.

**Marking criteria**

The project is marked by the project supervisor and second-marked in the Department. A significant fraction of the supervisor’s assessment is based on how well the project was tackled, difficulties overcome, etc. The second marker concentrates on the quality of the project as made evident in the report. The two examiners agree a mark that is sent to the Visiting Examiner together with a copy of the report for comment.

Students make an oral presentation and a poster presentation of their work, which contributes 20% to the overall mark. This provides an opportunity to demonstrate communication and other skills.

Students need to achieve at least a pass mark (50%) in their project in order to proceed to the second year. The following assessment criteria apply:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Typical characteristics (as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 100%</td>
<td><strong>Outstanding work.</strong> Outstanding execution and report, showing good planning, good initiative, clarity of work, insight and pertinent comments.</td>
</tr>
<tr>
<td>70 - 79%</td>
<td><strong>Excellent work.</strong> Excellent clear record, results and their presentation, appropriate analysis and a summary with reasoned conclusions.</td>
</tr>
<tr>
<td>60 - 69%</td>
<td><strong>Good work.</strong> Project and record mostly complete, good results and presentation, analysis with some error estimates (if appropriate), limited conclusions.</td>
</tr>
<tr>
<td>50 - 59%</td>
<td><strong>Competent work.</strong> Good progress achieved, some record, results partly analyzed, perhaps with limited critical evaluation, limited summary.</td>
</tr>
<tr>
<td>40 - 49%</td>
<td><strong>Modest work.</strong> Limited progress, incomplete report, some analysis, perhaps no evaluation or summary.</td>
</tr>
<tr>
<td>30 - 39%</td>
<td><strong>Poor work.</strong> Work only partly done, very poor record, with little analysis, few graphs, no error estimates or summary.</td>
</tr>
<tr>
<td>0 - 29%</td>
<td><strong>Very poor work.</strong> Very little submitted. Missing some or all of work record, results, analysis or summary.</td>
</tr>
</tbody>
</table>
7.4 The 2nd year Research Project

In the second year you will conduct a Research Project PH5500 (60 ECTS). Associated with this, you may take a series of specialist research training courses. These will be delivered through a combination of lectures, directed study and seminars.

Choice of Research Project topic

Topics available for Research Projects are presented to students during the first year in the form of a title, brief abstract, any prerequisite skills or knowledge required and the name of the project supervisor. It is important to discuss potential projects with the supervisors offering them before making a final choice. The range of projects available is wide, reflecting the diverse interests of the academic staff. Details of the research areas and the staff involved are to be found on the Department’s web pages. In addition, some projects will be developed in consultation with Rutherford Appleton Laboratory and the Harwell Science and Innovation Campus (including ISIS neutron spallation source and Diamond synchrotron x-ray scattering facility), Oxford Instruments plc (a major employer in the field), the National Physical Laboratory, CERN and other institutions. Thus the spectrum of projects ranges from fundamental science to problems of industrial relevance; the choice reflects the interests of the student. Projects can be:

- Experimental, for example development of a new technique or instrument, measurements on new problems using established techniques;
- Analysis of data from ongoing experiments;
- Computational, for example use of Monte Carlo methods in simulating physical systems;
- Theoretical, either fundamental theory, modelling of a particular experiment, or modelling of the performance of a scientific instrument.

The Research Project supervisor

The project supervisor directs the project, defines what is expected, advises on background literature and what skills are to be developed. A two-page progress report must be submitted to the Programme Director by the end of January and students will give brief presentations on their work. The purpose of this short report is to ensure that the scope of the project is well defined and that substantial progress has already been made. The brief (~ 5 minute) presentation should comprise three slides covering: aims of project, results obtained so far, and a plan for the remainder of project. The experimental, theoretical and computational work should be completed in good time to ensure that the thesis can be submitted by the deadline in the summer term.

Content of Research Project

The thesis must contain an abstract, an introduction setting the work in context, a survey of the relevant literature, and a report of the work carried out. Advice on writing a scientific report is contained in the Handbook of Skills Training for Physics Students. The project supervisor gives further advice and reads and comments on the first draft.
**Presentation**
The thesis must be written using a word processor or LATEX and be well presented. It should be bound in a simple binding such as can be done in the Department (a hard cover is not necessary). The title of the project and the student’s name must be clearly visible on the front cover.

**Word count**
The length of the thesis should be between 15,000 and 20,000 words (excluding figures). All over-length work submitted will be penalised.

**Marking criteria**
In assessing the project thesis the examiners are looking for a clear description of the work carried out, a good knowledge and understanding of the work done, a clear set of results and conclusion, a well-argued document, and good standards of English and presentation. The achievements should be commensurate with what a reasonable student can achieve in the time allocated.

The research project is marked by an External Assessor, the project supervisor and second-marked in the Department. The agreed mark is sent to the Visiting Examiner together with a copy of the project report for comment.

Students need to achieve at least a pass mark (50%) in their research project in order to be awarded the degree. The following assessment criteria apply:

<table>
<thead>
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<td>0 - 29%</td>
<td><strong>Very poor work.</strong> Very little submitted. Missing some or all of work record, results, analysis or summary.</td>
</tr>
</tbody>
</table>

There is an oral examination following submission of the project at which the Visiting Examiner and at least one other examiner is present. The student should bring a ~15 minute presentation on a laptop or a stick. The presentation should introduce the aims and context of the research project, describe the results and draw suitable conclusions. The subsequent oral examination may probe any aspect of understanding of the material in the programme but frequently places special emphasis on the project. A good performance in this examination may be used to raise the award of a borderline candidate.
8 Assessment Information

8.1 Illness or other extenuating circumstances

Students are advised to carefully read the Instructions to candidates as well as the Extenuating circumstances – Guidance for students.

Extenuating circumstances are defined as unforeseen circumstances which are outside a student’s control and which may temporarily prevent a student from undertaking an assessment or have a marked/significant detrimental/adverse impact on their ability to undertake assessment by coursework or examination to the standard normally expected.

This means that such circumstances rarely occur. They are outside your control as they are:

- Unforeseeable - you would not have prior knowledge of the event (e.g. you cannot foresee that you will be involved in a car accident);
- Unpreventable – you could not reasonably do anything in your power to prevent such an event (e.g. you cannot reasonably prevent a burst appendix.)

It is these short-term (temporary) circumstances that the College normally regards as extenuating circumstances.

Inability to submit coursework

If you are unable to submit coursework through unexpected illness or other acceptable cause (i.e. events which are unpreventable and unforeseeable) it is assumed that you will request an extension to the submission deadline from your department. In order for an extension to be granted you will need to provide the department with adequate documentation in accordance with the guidance in Appendix B of the Extenuating Circumstances – Guidance for students. The decision on whether to grant an extension rests with your department.

Absence from an examination

The Sub-board of Examiners may take the following into account when considering your results: if you miss an examination through unexpected illness, or other acceptable cause (events which are unpreventable and unforeseeable), if you commence an examination and have to leave due to acute illness or if you believe your performance on the day was seriously compromised by an unexpected and acute illness that you could not reasonably have been expected to have managed otherwise. You will, however, need to submit an Extenuating Circumstances form and have adequate supporting documentation in accordance with Appendix B of Extenuating Circumstances – Guidance for students. You should also read the section Illness & absences from an examination and departmental assessments and extenuating circumstances in the Instructions to Candidates issued by Student Administration http://www.royalholloway.ac.uk/ecampus/academicsupport/examinations/examinations/home.aspx for full details on how to inform your department about extenuating circumstances relating to missed examinations as well as the deadline for submission of such information.
Ongoing circumstances

If you have ongoing circumstances that you believe are adversely affecting your performance during the year, these should be raised with your department and with the College’s Support and Advisory Services as soon as possible so that strategies to help you manage the situation can be considered e.g. you have an illness that does not constitute a disability, a family member is ill and needs your support or you have suffered an adverse life event.

It may that the circumstances are severely impacting on your ability to study by causing you to repeatedly miss scheduled teaching and/or impacting on your ability to complete assessments at the designated time. If this is the case and there is not a reasonable method available to enable you to manage the situation, you may need to consider, in consultation with your department and Support and Advisory Services, whether it would not be in your best interests to interrupt until the issues have been resolved and you are able to fully commit to and benefit from your academic studies.

Ongoing adverse circumstances do not normally constitute extenuating circumstances as they are not unforeseen and in some cases are not unpreventable. There is therefore very little that the Sub-board can do, in terms of current College regulations, to mitigate such circumstances.

Please read the Extenuating circumstances – Guidance for students, in particular Section 5.

Support and exam access arrangements for disabled students and those in need of support

Some students at the College may have a physical or mental impairment, chronic medical condition or a Specific Learning Difficulty (SpLD) which would count as a disability as defined by the Equality Act (2010) that is, “a physical or mental impairment which has a long-term and substantial effect on your ability to carry out normal day-to-day activities”. It is for such conditions and SpLDs that Disability and Dyslexia Services can put in place support and exam access arrangements. Please note that a “long-term” impairment is one that has lasted or is likely to last for 12 months or more.

If you have a disability or SpLD you must register with the Disability and Dyslexia Services Office for an assessment of your needs before support and exam access arrangements (‘reasonable adjustments’) can be put in place. There is a process to apply for special arrangements for your examinations. Disability and Dyslexia Services can discuss this process with you when they assess your needs. Please see the section Students in need of support (including disabled students) for further guidance about registering with the Disability and Dyslexia Services Office.

Please note that if reasonable adjustments, including exam access arrangements, have been put in place for you during the academic year, the Sub-board will not normally make further allowance in relation to your disability or SpLD.

8.2 Submission of written work

Coursework is usually submitted in ‘hard copy’ form by placing it in the appropriate ‘post-box’ in the departmental post room. Some course leaders may accept or require coursework to be submitted electronically. All coursework should be
submitted by the specified deadline. Please ensure that you are aware of the deadlines set by the course leader.

8.3 Extensions to deadlines

Sympathetic treatment will be given for documented illness or other good cause. Where possible, new deadlines should be agreed with the member of staff concerned before the stated deadline. Students that miss deadlines through illness should see the staff member concerned on their return and complete a Notification of Absence form (available on eCampus http://www.rhul.ac.uk/ecampus/academicsupport/attendance/notificationofabsence.aspx).

Note that the loss of coursework prior to submission due to any type of computer failure (e.g. file corruption) is not an acceptable reason for late submission or non-submission of work. It is your responsibility to follow well-known IT precautionary procedures. Specifically, frequently back up your work to a location remote from your PC. You are also strongly advised not to leave irreplaceable work (lecture notes, coursework, project reports) in an unattended car, where they or the car may be stolen.

8.4 Penalties for late submission of work

Work submitted after the published deadline will be penalised in line with Section 13 (5) of the College’s Postgraduate Taught Regulations 2016-17 (https://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.aspx)

Please ensure that you are aware of the deadlines set by your department(s) and also the requirements to meet this deadline, e.g. whether you need to submit electronic and/ or paper copies for your submission to be deemed complete (see 8.2 above).

Section 13 (5)
In the absence of acceptable extenuating cause, late submission of work will be penalised as follows:

- for work submitted up to 24 hours late, the mark will be reduced by ten percentage marks;*
- for work submitted more than 24 hours late, the mark will be zero.

*eg, an awarded mark of 65% would be reduced to 55% and a mark of 42% would be reduced to 32%.

If you have had extenuating circumstances which have affected your ability to submit work by the deadline these should be submitted in writing, accompanied by any relevant documentary evidence, to your department(s). As with all extenuating circumstances it is the discretion of the examiners whether to accept these as a reason for having not submitted work on time. Please see the section on applying for an extension to the deadlines set, and the section for details on submitting requests for extenuating circumstances to be considered.
8.5 Anonymous marking and cover sheets

Anonymous marking is used for examinations and for some pieces of work throughout the year. Each student is issued with a candidate number for this purpose. This number is independent of your student number and should not be confused with it.

8.6 Penalties for over-length work

Work which is longer than the stipulated length in the assessment brief will be penalised in line with Section 13 (6) of the College’s Postgraduate Taught Regulations 2016-17 (https://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.aspx)

Work which exceeds the upper word limit will be penalised as follows:

(a) for work which exceeds the upper word limit by up to 10%, the mark will be reduced by ten percent of the mark initially awarded;

(b) for work which exceeds the upper word limit by more than 10% but less than 20%, the mark will be reduced by twenty percent of the mark initially awarded;

(c) for work which exceeds the upper word limit by more than 20%, the mark will be reduced by thirty percent of the mark initially awarded.

eg. an awarded mark of 65% would be reduced to 55%.

In addition to the text, the word count should include quotations and footnotes. Please note that the following are excluded from the word count: candidate number, title, course title, preliminary pages, bibliography and appendices.

8.7 Return of written coursework

The following College policy applies to the return of coursework:

Assessed work (other than formal examinations) should be returned within 4 weeks of the submission deadline, except in cases where it is not appropriate to do so for academic reasons. The deadline for the return of marked work should be made clear to students when they receive their assignments. In the event that the intended deadline cannot be met, the revised deadline must be communicated to students as soon as possible.

8.8 Assessment offences

The College has regulations governing assessment offences which can be found on the following webpage:

http://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.aspx

Assessment offences include, but are not limited to plagiarism (see 7.9 below), duplication of work, that is, submitting work for assessment which has already been submitted for assessment in the same or another course, falsification, collusion, for
example, group working would constitute collusion where the discipline or the method of assessment emphasises independent study and collective ideas are presented as uniquely those of the individual submitting the work, failure to comply with the rules governing assessment (including those set out in the ‘Instructions to candidates’). The Regulations set out some of the types of assessment offences in more detail, the procedures for investigation into allegations of such offences and the penalties. Students are strongly encouraged to read these Regulations and to speak with their Personal Advisors or other members of staff in their department should they have any queries about what constitutes an assessment offence. The College treats assessment offences very seriously and misunderstanding about what constitutes an assessment offence will not be accepted as an excuse. Similarly extenuating circumstances cannot excuse an assessment offence. Students with extenuating circumstances which affect their ability to submit work should contact their departments about the possibility of an extension or other support.

8.9 Plagiarism

Definition of plagiarism

‘Plagiarism’ means the presentation of another person’s work in any quantity without adequately identifying it and citing its source in a way which is consistent with good scholarly practice in the discipline and commensurate with the level of professional conduct expected from the student. The source which is plagiarised may take any form (including words, graphs and images, musical texts, data, source code, ideas or judgements) and may exist in any published or unpublished medium, including the internet.

Plagiarism may occur in any piece of work presented by a student, including examination scripts, although standards for citation of sources may vary dependent on the method of assessment. Identifying plagiarism is a matter of expert academic judgement, based on a comparison across the student’s work and on knowledge of sources, practices and expectations for professional conduct in the discipline. Therefore it is possible to determine that an offence has occurred from an assessment of the student’s work alone, without reference to further evidence.

8.10 Marking of illegible scripts

It is College policy not to mark scripts which are illegible. If you anticipate that you may have difficulty in handwriting scripts which would lead to your scripts being illegible you should contact the Disability and Dyslexia Services. 
https://www.royalholloway.ac.uk/students/help-support/disabilities-and-dyslexia/home.aspx Progression and award requirement

The Regulations governing progression and award requirements are set out in your Programme Specification (http://www.rhul.ac.uk/coursecatalogue/home.aspx) and also more generally in the Postgraduate Taught Regulations http://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.aspx

If you do not pass a course unit at a first attempt you may be given an opportunity to ‘re-sit’ or ‘repeat’ the course unit.
**Re-sit of a failed course unit** – normally gives students an opportunity during the following academic year to re-sit any failed parts of a course unit not passed. Students do not have to attend any classes. Marks for work which has been passed will be carried forward. Students are required to register to resit course units. Unless students have been informed otherwise, the mark for such courses will be capped at 50%.

**Repeat of a failed course unit** – if you are given the opportunity to repeat a course unit in attendance you will need to register for the course unit for the following academic year and satisfy afresh all the assessment and attendance requirements, that is, you are expected to attend all classes and redo all required coursework and examinations for the course unit. No marks from the previous attempt at the course unit are carried forward and no work from completed as part of the first attempt at the course may be resubmitted for assessment. The mark for a course repeated in attendance is not capped.

Please note that it is not possible to re-sit or repeat a course unit which you have passed.

**NB:** Students entered to resit an examination will normally not receive an overall percentage mark greater than 50% for that course unit.

**Outcomes of course unit assessment**
The Postgraduate Taught Regulations require that for a student to qualify for final consideration in a course unit by the Sub-board of Examiners, a candidate must first:

(a) have satisfied the attendance requirements specified for the course;

(b) have completed and presented for assessment all work specified for the course within specified deadlines.

The Sub-board of Examiners will determine an outcome and a percentage mark recorded as an integer between 0% and 100% inclusive for each candidate who qualifies for final consideration, as follows:

(a) an outcome of Pass (P) with a percentage mark will be returned where the candidate has achieved a mark of 50% or above overall and in all elements of the assessment which carry an individual pass requirement;

(b) an outcome of Fail (F) with a percentage mark will be returned where the candidate has achieved a mark of 49% or below overall, or in any element of the assessment which carries an individual pass requirement;

For details on the requirements governing the level of award please see the section on the Consideration and Classification of Candidates for the Award in the Postgraduate Taught Regulations.

http://www.royalholloway.ac.uk/ecampus/academicsupport/regulations/home.asp
8.11 Examination/assessment results

Please see the Examinations & Assessments website http://www.royalholloway.ac.uk/ecampus/academicsupport/examinations/home.aspx for details of how you will be issued with your results. http://www.royalholloway.ac.uk/ecampus/academicsupport/examinations/results.aspx

The Examinations & Assessments website is the place where you can access the “Instructions to Candidates” and details of the examinations appeals procedures. http://www.royalholloway.ac.uk/ecampus/academicsupport/academicappealsandcollegecomplaints.aspx

9 Student Support

9.1 Non-academic related enquiries & support

The Student Services Centre is located in the Windsor Building and provides a single point of contact for all non-academic related queries including accommodation, fees and funding, enrolment and graduation. For further details please visit http://www.royalholloway.ac.uk/ssc

9.2 Students in need of support (including students with special needs)

Your first point of reference for advice within the Department is the Programme Director or Faculty Administrator (PGT). Inevitably, problems will sometimes arise that neither are qualified to deal with. The College offers a high level of student welfare support which includes a comprehensive Health Centre, a highly regarded Counselling Service, dedicated educational and disability support, as well as a wealth of financial, career and other advice. Further details of each service can be found on the College web on the Student Welfare page: http://www.royalholloway.ac.uk/ecampus/welfare/home.aspx

If you have a disability or specific learning difficulty, it is important that you bring it to our attention as soon as possible. The Departmental Disability and Dyslexia Service (DDS) representative is the Senior Tutor or the Faculty Administrator (undergraduates). You must also contact the DDS (Founders West 143; tel: +44 (0)1784 276473; email: disability-dyslexia@royalholloway.ac.uk) who will arrange for an assessment of needs to be carried out and will advise on appropriate sources of help. Further information is available on the College web on the Support, health and welfare page https://www.royalholloway.ac.uk/studentlife/supportthehealthandwelfare/home.aspx

9.3 Academic skills support

The Centre for the Development of Academic Skills (CeDAS) offers a variety of courses, workshops, 1:1 tutorials, online resources that aim to ensure all students at Royal Holloway reach their full academic potential in a range of areas, including academic writing, oral communication skills and maths and statistics.

Whatever your needs, CeDAS is there to ensure that you can perform to the best of your ability, whether it be through a workshop that introduces you to a crucial
academic skill, a session within your department that focuses on writing in the discipline, a course that develops your confidence and competence in academic English language, or a 1:1 tutorial with a specialist to help you master a maths technique or sharpen your essay skills.

The Centre also oversees the Royal Holloway Proofreading Scheme, which enables students to pay for an approved third-party proofreader to identify surface error in final drafts. Please note that Royal Holloway does not permit the use of paid third-party proofreaders who are not part of this scheme.

The CeDAS Office can be found on the ground floor of the International Building, room IN002, and you can follow them on Twitter: @cedashul. Further details can be found on the CeDAS webpages: www.royalholloway.ac.uk/cedas.

9.4 Student-staff committee
There is a student-staff committee on which both taught and research students are represented (for constitution see http://www.royalholloway.ac.uk/iquad/collegepolicies/home.aspx. The Committee meets three times each year and plays an important role in the Department as a forum for airing student views. You can use the Committee to raise any issues which concern students. Notices will appear on departmental notice boards giving details of forthcoming elections or the names of current representatives. You are also encouraged to attend the Postgraduate Forum.

9.5 Postgraduate committees
The Department's Student-Staff Committee meets at least termly and includes teaching representatives from all MSc programmes. It considers the development of the curriculum. Since the MSc is a postgraduate programme covering material at the forefront of research detailed content is likely to be updated annually to reflect recent developments in the field.

In addition, the Postgraduate Forum is a mechanism for students to raise issues related to research and provide feedback to the Department. There are three meetings per year at which all postgraduates are invited to attend.

Annual monitoring is carried out by the Student-Staff Committee, and it includes an evaluation of individual courses and consideration of replies to the student questionnaires. The visits and guest lectures will also be evaluated from student responses. The Programme Director evaluates the course annually and makes a written report to the Faculty of Science. The Faculty considers this, alongside reports from the External Examiner as part of the annual review of taught masters courses.

External monitoring is carried out through a Visiting Examiner who has the right to request copies of any or all of the work on which assessments are based and can recommend that provisional marks assigned by internal examiners be adjusted. The Visiting Examiner is required to produce an annual report and can comment on any aspects of the programme including aims and objectives, academic standards, assessment procedures, structure, content, administration and delivery.
9.6 Students’ Union

The Students’ Union offers a wide range of services and support, from entertainment and clubs/societies to advice on welfare and academic issues. The Advice and Support Centre, situated on the first floor of the Students’ Union, runs a confidential service that is independent from the College. Open 9.30am - 5pm, Monday – Friday, it operates an open door policy exclusively for students during term time. However, during vacation periods students should call to book an appointment. Full details can be found at https://www.su.rhul.ac.uk/about/

9.7 Careers information

The College has a careers advisory service, housed in the Horton Building, which is open to any student during normal College hours. http://www.royalholloway.ac.uk/careers/home.aspx

9.8 Non-academic policies

Please see the Regulations and procedures webpage http://www.students.royalholloway.ac.uk/study/read-our-college-regulations-and-procedures/ which includes information on non-academic policies, regulations, and codes of practice as well as the Student Charter. http://www.royalholloway.ac.uk/aboutus/governancematters/studentcharter.aspx

9.9 Complaints and academic appeals procedure

If you have a complaint relating to any aspect of the Department or its staff or to any academic or College matter, you should first discuss it informally with your Personal Advisor or with another member of staff in the Department. We would hope that the majority of issues of this kind can be resolved by informal discussion. There are, however, procedures that can be invoked in serious cases. These are set out in the College Complaints Procedures for students http://www.royalholloway.ac.uk/ecampus/academicsupport/complaints/complaints.aspx. You should raise your complaint as soon as possible.

If the complaint concerns an academic decision, there is an academic appeals process. Please note that an academic appeal can only be submitted once you have received your results via the College portal. Details of the appeals procedures and permitted grounds for appeal can be found on the following webpage http://www.royalholloway.ac.uk/ecampus/academicsupport/academicappealsandcollegecomplaints.aspx

10 Health and Safety Information

10.1 Code of practice on harassment for students

This can be found on the student home pages under regulations and procedures http://www.students.royalholloway.ac.uk/study/read-our-college-regulations-and-procedures/
10.2 Lone working policy and procedures

The College has a ‘Lone Working Policy and Procedure’ that can be found at
http://www.royalholloway.ac.uk/iquad/services/healthandsafety/policiesandprocedures/loneworking.aspx

Lone working is defined as working during either normal working hours at an isolated location within the normal workplace or when working outside of normal hours. The Department and the type of work conducted by students is classified as a high risk activity and as such the following advice is relevant.

Any health and safety concerns should be brought to the attention of the Departmental Health and Safety Co-ordinator or the College Health and Safety Office.

It is likely that most activities will take place on College premises. However, the principles contained in the above section will apply to students undertaking duties off campus.

11 Equal Opportunities Statement and College Codes of Practice

11.1 Equal opportunities statement

The University of London was established to provide education on the basis of merit above and without regard to race, creed or political belief and was the first university in the United Kingdom to admit women to its degrees.

Royal Holloway, University of London (hereafter ‘the College’) is proud to continue this tradition, and to commit itself to equality of opportunity in employment, admissions and in its teaching, learning and research activities.

The College is committed to ensure that:

- all staff, students, applicants for employment or study, visitors and other persons in contact with the College are treated fairly, have equality of opportunity and do not suffer disadvantage on the basis of race, nationality, ethnic origin, gender, age, marital or parental status, dependants, disability, sexual orientation, religion, political belief or social origins
- both existing staff and students, as well as, applicants for employment or admission are treated fairly and individuals are judged solely on merit and by reference to their skills, abilities qualifications, aptitude and potential
- it puts in place appropriate measures to eliminate discrimination and to promote equality of opportunity
- teaching, learning and research are free from all forms of discrimination and continually provide equality of opportunity
- all staff, students and visitors are aware of the Equal Opportunities Statement through College publicity material
- it creates a positive, inclusive atmosphere, based on respect for diversity within
the College

- it conforms to all provisions as laid out in legislation promoting equality of opportunity.

11.2 College codes of practice

Royal Holloway lays down firm codes of practice for its staff and students on the Academic Welfare of Students, on Freedom of Speech, on Sexual and Racial Harassment, and on Safety, Security and Parking. You will find these codes of practice in the General Regulations [https://www.royalholloway.ac.uk/aboutus/governancematters/studenthandbook/home.aspx](https://www.royalholloway.ac.uk/aboutus/governancematters/studenthandbook/home.aspx)

If you feel you are the victim of an infringement of any of these codes, or of any legal right, take the matter up with any of the following, as you see fit:

- your Personal Adviser;
- your Programme Director;
- the Head of Department;
- any other member of Department teaching staff you prefer to deal with;
- the Head of Support and Advisory Services (tel. 3395);
- the Student Counselling Service (tel. 3128);
- any Students’ Union officer.
Appendix 1: Lecture Courses

The following courses are taught jointly by King’s, Royal Holloway, Queen Mary and University College staff. The MSci handbook gives full details of all courses and where they are taught except for the Euromasters specific courses PH5210 and PH5500 which are included here in the handbook in Appendices 3 and 4 respectively. The MSci handbook and the timetable are available on Moodle and the MSci webpages http://www.rhul.ac.uk/physics/informationforcurrentstudents/msci4thyear/msci4thyear.aspx.

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<td>PH 5479X</td>
<td>Advanced Condensed Matter</td>
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<tr>
<td>PH 5501X</td>
<td>Standard Model Physics and Beyond</td>
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<td>PH 5512</td>
<td>Nuclear Magnetic Resonance</td>
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<td>PH 5515</td>
<td>Statistical Data Analysis</td>
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<td>PH 5534X</td>
<td>String Theory and Branes (m)</td>
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<td>PH 5541X</td>
<td>Supersymmetry</td>
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<td>PH 5600X</td>
<td>Stellar Structure &amp; Evolution</td>
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<td>Astroparticle Cosmology</td>
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<td>PH 5616X</td>
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<td>PH 5630X</td>
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<td>PH 5650X</td>
<td>Solar System</td>
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<td>PH 5660X</td>
<td>The Galaxy</td>
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<td>PH 5670X</td>
<td>Astrophysical Plasmas</td>
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<td>PH 5680X</td>
<td>Space Plasma &amp; Magnetospheric Physics</td>
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<tr>
<td>PH 5690X</td>
<td>Extrasolar Planets &amp; Astrophysical Discs</td>
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<tr>
<td>PH 5702X</td>
<td>Environmental Remote Sensing</td>
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<td>PH 5800X</td>
<td>Molecular Biophysics</td>
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<tr>
<td>PH 5805X</td>
<td>Cellular Biophysics</td>
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<td>PH 5810X</td>
<td>Theory of Complex Networks</td>
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<tr>
<td>PH 5820X</td>
<td>Equilibrium Analysis of Complex Systems</td>
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<td>PH 5830X</td>
<td>Dynamical Analysis of Complex Systems</td>
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<tr>
<td>PH 5840X</td>
<td>Mathematical Biology</td>
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<tr>
<td>PH 5850X</td>
<td>Elements of Statistical Learning</td>
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</table>

* Course codes for UG MSci students are in the format PH4xxx, whereas course codes for PG students are in the format PH5xxx (e.g. PH4211 Statistical Mechanics as listed in the MSci Handbook becomes PH5211 when taken as part of a PG programme)
This document describes the MSc in Physics (Euro Masters) programme offered in the Physics Department. This specification is valid for new entrants from September 2015.

This is a two-year programme designed to conform to the highest European (and international) standards. Similar programmes are available at other physics departments of the South-East Physics Network (SEPNet), a consortium of the departments from RHUL, QMUL and the Universities of Southampton, Surrey, Sussex and Kent. A key feature of the programme is the possibility of combining studies at more than one partner department; thus a student could spend one year at one department and the second at another.

The aims of the programme are:

- to equip students for future careers, in the UK and internationally, including research in universities, industry and other organisations;
- provide a technical background for a broader range of careers in the industrial scientific instrument sector and elsewhere;
- develop an advanced knowledge of a chosen area of contemporary physics via lecture courses;
- obtain training in research techniques through lecture courses, directed study, and an individual project;
- develop key skills relevant for a postgraduate science student.

Upon successful completion of the programme students will be well-prepared for doctoral research in the best universities around the world.

The Department has close links with Rutherford Appleton Laboratory and the Harwell Science and Innovation Campus (including ISIS neutron spallation source and DIAMOND synchrotron x-ray scattering facility), Oxford Instruments plc (a major employer in the field), the National Physical Laboratory, CERN and other institutions. An important element of this programme, which ensures its wider relevance, involves external involvement in the programme. This entails:

- input on the course content;
- collaborative projects (some projects may involve time spent at these collaborators);
- visits to industrial facilities and laboratories;
- guest lectures.

This document provides a summary of the main features of the programme(s), and of the outcomes which a student might reasonably be expected to achieve if full advantage is taken of the learning opportunities provided. Further information is contained in the College prospectus, the College Regulations and in various
handbooks issued to students upon arrival. Whilst Royal Holloway keeps all its information for prospective applicants and students under review, programmes and the availability of individual courses are necessarily subject to change at any time, and prospective applicants are therefore advised to seek confirmation of any factors which might affect their decision to follow a specific programme. In turn, Royal Holloway will inform applicants and students as soon as is practicable of any substantial changes which might affect their studies.

Learning outcomes
Teaching and learning in the programme are closely informed by the active research of staff. In general terms, the programme provides opportunities for students to develop and demonstrate the following learning outcomes:

Knowledge and understanding:
- a systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the discipline;
- a comprehensive understanding of techniques applicable to their own research or advanced scholarship;
- originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline.

Skills and other attributes
- problem-solving skills – applied in new or unfamiliar environments;*
- learning skills – including self-directed and autonomous study;*
- investigative skills;*
- information retrieval skills;*
- communication skills – to both specialists and non-specialists;*
- analytical skills;*
- IT skills;*
- personal skills such as teamwork and independence.*
- In addition, as a result of carrying out the research project students should develop research skills using a mix of experimental, theoretical and computational techniques appropriate to the field together with related transferable skills. The project will provide students with an opportunity for originality in developing and applying their ideas. Students should develop their communication skills and apply them to the writing of the project report and the presentation of an oral report on the project.

*Transferable skills

Teaching, learning and assessment
A variety of teaching methods will be used, including lectures, directed study, seminars and one-on-one sessions. The Programme makes use of the Department’s dedicated Audio-Visual suite so that courses may be shared with other institutions of the South-East Physics Network (SEPnet) and/or other colleges of the University of London. Assessment is based on the Project thesis, course examinations and coursework. Full details of the assessments for individual courses can be obtained from the Department.
Details of the programme structure(s)

Please note that not all optional courses run each year. A full list of optional courses for the current academic year can be obtained from the Department.

Students must take the following mandatory second year course:
PH5100: Project (15 ECTS) non-condonable;

and choose six optional courses in their first year (7.5 ECTS) from the list below:

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<td>PH 5479X</td>
<td>Advanced Condensed Matter</td>
</tr>
<tr>
<td>PH 5501X</td>
<td>Standard Model Physics and Beyond</td>
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<td>PH 5512</td>
<td>Nuclear Magnetic Resonance</td>
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<td>PH 5515</td>
<td>Statistical Data Analysis</td>
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<tr>
<td>PH 5534X</td>
<td>String Theory and Branes (m)</td>
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<td>PH 5541X</td>
<td>Supersymmetry</td>
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<td>PH 5600X</td>
<td>Stellar Structure &amp; Evolution</td>
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<td>PH 5601X</td>
<td>Cosmology</td>
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<tr>
<td>PH 5602X</td>
<td>Relativity and Gravitation</td>
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<td>PH 5605X</td>
<td>Astroparticle Cosmology</td>
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<tr>
<td>PH 5616X</td>
<td>Electromagnetic Radiation in Astrophysics</td>
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<tr>
<td>PH 5630X</td>
<td>Planetary Atmospheres</td>
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<tr>
<td>PH 5640X</td>
<td>Solar Physics</td>
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</table>
**Progression and award requirements**

Students leaving or transferring to another SEPnet partner after completion of the first year will be awarded a Postgraduate Diploma in Physics (PGDip Physics) from RHUL.

To pass the PGDip programme a student must achieve an overall weighted average of at least 50.00%, with no mark in any element which counts towards the final assessment falling below 50%. Failure marks between 40-49% are not usually condoned for the award of a Postgraduate Diploma, but if they are, such condoned fails would be in courses which do not constitute more than 25% of the final assessment, provided that the overall weighted average is at least 50.00%, but a failure mark (i.e. below 50%) in the Project cannot be condoned.

The PGDip degree with Merit may be awarded if a student achieves an overall weighted average of 60.00% or above, with no mark in any element which counts towards the final assessment falling below 50%.

The PGDip degree with Distinction may be awarded if a student achieves an overall weighted average of 70.00% or above, with no mark in any element which counts towards the final assessment falling below 50%. A Distinction will not normally be awarded if a student re-sits or re-takes any element of the programme. In exceptional circumstances a viva may be held for a student at the request of the Examiners.

In order to progress from the first to the second year of this MSc programme a student must achieve the standard of a PGDip in their first year. Students must pass the Project. Students must pass at least four of the taught courses, with an average of at least 50.00% over the six courses taken. Progressing students have the option to re-sit or re-take failed courses.

To pass the MSc programme a student must achieve an overall weighted average of at least 50.00%, with no mark in any element which counts towards the final assessment falling below 50%. Failure marks between 40-49% can be condoned in
courses which do not constitute more than 25% of the final assessment, provided that the overall weighted average is at least 50.00%, but a failure mark (i.e. below 50%) in the Research Project cannot be condoned.

The Masters degree with Merit may be awarded if a student achieves an overall weighted average of 60.00% or above, with no mark in any element which counts towards the final assessment falling below 50%. The Merit will not normally be awarded if a student re-sits or re-takes any element of the programme.

The Masters degree with Distinction may be awarded if a student achieves an overall weighted average of 70.00% or above, with no mark in any element which counts towards the final assessment falling below 50%. A Distinction will not normally be awarded if a student re-sits or re-takes any element of the programme. There is an oral examination, normally in the last week of the programme, at which the Visiting Examiner and at least one other examiner is present.

Students from other SEPNet partners and elsewhere joining the second year of the programme, having satisfied the admission requirements (to the second year) specified below, will be assessed on their second-year performance only.

**Student support and guidance**

- The Director of Graduate Studies holds an induction meeting for all new postgraduate students in the first week of the programme.
- The Programme Director provides primary support for each student, including overall personal and academic welfare.
- The Project Supervisor provides additional academic support. Teachers of the lecture courses monitor progress on the courses. Supervisors and teachers provide progress reports on each student at each meeting of the Postgraduate Committee.
- Representation on the Student-Staff Committee.
- Detailed PG handbook and course booklets.
- Extensive supporting materials and learning resources in College and University libraries, as well as the Computer Centre.
- College Careers Service and Departmental Employability Lead Officer.
- Access to all College and University support services, including Student Counselling Service, Health Centre, Students’ Union and students with additional learning needs also have access to Disability and Dyslexia Services (ESO).
- Postgraduate seminars and meetings, research colloquia, Physics Society meetings and parties.

**Admission requirements**
For details of admissions requirements please refer to the Course Finder.

**Further learning and career opportunities**
This programme provides an ideal grounding for students to pursue PhD programmes in universities, and to equip them for future research careers in universities, industry and other organisations in Europe and around the world. The programmes will also provide a technical background for a broader range of careers in the industrial scientific instrument sector and elsewhere around the world. For more details on further learning and career opportunities please refer to the Careers Service.
Indicators of quality and standards
Royal Holloway’s position as one of the UK’s leading research-intensive institutions was confirmed by the results of the most recent Research Excellence Framework (REF 2014) conducted by the Higher Education Funding Council (HEFCE). The scoring system for the REF 2014 measures research quality in four categories, with the top score of 4* indicating quality that is world-leading and of the highest standards in terms of originality, significance and rigour and 3* indicating research that is internationally excellent. 81% of the College’s research profile was deemed to be within the 4* or 3* categories, an increase of over 20% since 2008. This results for the quality of our research outputs placed Royal Holloway 15th in the UK based on an overall Grade Point Average (GPA) score and 20th in the UK for 4* and 3* research. The Department of Physics is ranked 35 in the UK for research of 4* standard and 34 for 3* and 4* research.

List of programmes
The programmes are taught by staff at Royal Holloway, in conjunction with staff from other colleges of the University of London for some of the taught courses. The Masters leads to an award of the University of London. The Postgraduate Diploma leads to an award of Royal Holloway and Bedford New College. Postgraduate programmes in Physics are not subject to accreditation by a professional body. The Banner programme codes are given in parentheses.
• MSc in Physics (Euro Masters) (2441)
• PG Diploma Physics (xxxx)

Version 7.0
Dated: 13/9/16
# Appendix 3: Course Specification – PH5210

<table>
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<th>PHYSICS</th>
<th>Academic Session:</th>
<th>201617</th>
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<td>Course Value:</td>
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<td>Availability:</td>
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<td>Co-requisites:</td>
<td>None</td>
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<tr>
<td>Co-ordinator:</td>
<td>Dr A Ho</td>
<td>Course Staff:</td>
<td>Dr A Ho</td>
</tr>
</tbody>
</table>

## Aims:
To explain the main principles and ideas of non-relativistic quantum mechanics, its structure and its formalism.
To examine both exact and approximate methods of solving quantum problems.
To enable students to plan and carry out an assignment at the level of a theoretical project undertaken in a Masters course.

## Learning Outcomes:
On completion of the course, students should be able to:
- understand and use the bra-ket (Dirac) notation for quantum states;
- understand and use the vector space and matrix representation of operator formalism, expansion of any states in terms of some complete set, the ladder operator approach to the harmonic oscillator;
- generalize the definition of angular momentum to include spin and solve the generalized angular momentum eigenvalue problem employing raising and lowering operator techniques;
- discuss the properties of spin-½ systems and use the Pauli matrices to solve simple problems; understand the concept and consequences of identical particles for fermions and bosons;
- state the rules for the addition of angular momenta and to outline the underlying general, mathematical arguments, applying them in particular to two spin-½ particles;
- formulate first-order and second-order time-independent perturbation theory, and apply to some simple examples;
- formulate the variational and WKB methods and apply to some simple systems;
- formulate first-order and second-order time-dependent perturbation theory, and show how it can lead to Fermi’s golden rule;
- show their ability to plan, execute and report on a substantial theoretical assignment at a level appropriate to Masters.

## Course Content:
**Formal Aspects of Quantum Mechanics**: Wavefunctions, principles of superposition, interference, state vectors and bra-ket (Dirac) notation, delta function. Compatible observers, simultaneous measurement and commuting operators. Expansion postulate and complete sets of states. The generalised uncertainty relations. Matrix representation of states and operators. Time dependent Schrödinger equation, expectation values, Hermitian operators, eigenstates, time evolution of operators. Periodic potential; Bloch theorem. Step-operator/ladder-operator approach to the harmonic oscillator, derivation of energy eigenvalues and wavefunctions (explicit forms for \( n = 0, 1 \)).
The Hydrogen Atom: Solution of the non-relativistic Schrödinger equation for an electron in the field of a stationary nucleus in spherical polar coordinates, obtain normalised eigenfunctions. Energy levels, angular momentum quantum numbers and their allowed values.


Approximate Methods: Time-independent perturbation theory for non-degenerate system to second order in the energy; to first order for degenerate systems. Examples. Variational principle, He ground state example. WKB approximation. Further examples of applications of quantum mechanics to atomic, nuclear and solid state physics; spin-dependent interactions, interaction of a hydrogen atom with a strong uniform external magnetic field, the Stark effect, anharmonic oscillator.

Identical Particles: Exchange symmetry for a system with identical fermions or bosons; derivation of the Pauli principle. Independent particle model of He, singlet and triplet states, exchange interaction.


Theoretical Assignment: Review appropriate literature, perform calculations as directed, and provide a 2000-word report on an advanced level topic in quantum mechanics.

Teaching & Learning Methods:
22 lectures, 12 hours work on assignment and 6 hours writing report, 5 feedback sessions
123 hours spent learning material, answering coursework problems and revision.

Details of teaching resources on Moodle:
- Course outline
- Lecture notes/summaries
- Additional notes
- Links to material of interest
- Problem sheets and solutions (at the appropriate time)
- Background material for theoretical assignment
- Instructions for calculations and writing report for assignment
- Links to past examination papers and selected solutions

Key Bibliography:
Recommended Purchase:

Further Reading:
Other books that will be useful:
| Formative Assessment & Feedback: | Students answer assessed problem sheets, which will then be discussed during feedback sessions. Students will receive a feedback sheet on their report by the first marker. |
| Summative Assessment: | **Exam:** (60%) (2 hours) Three questions to be answered out of six  
**Assignment:** (30%)  
**Coursework:** (10%)  
**Deadlines:** Normally within 2 weeks from issue of problem sheets, report to be handed in by the first day of Spring Term. |

The information contained in this course outline is correct at the time of publication, but may be subject to change as part of the Department’s policy of continuous improvement and development. Every effort will be made to notify you of any such changes.
## Appendix 4: Course Specification - 2nd Year Research Project

<table>
<thead>
<tr>
<th>Department:</th>
<th>Physics</th>
<th>Academic Session:</th>
<th>2016/17</th>
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<tr>
<td><strong>Course Title:</strong></td>
<td>Research Project (Euromasters)</td>
<td><strong>Course Value:</strong></td>
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<td><strong>Course JACS Code:</strong></td>
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<td><strong>Co-requisites:</strong></td>
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</tr>
<tr>
<td><strong>Co-ordinator:</strong></td>
<td>Academic staff of the Physics Department</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Course Staff:</strong></td>
<td>Academic staff of the Physics Department</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aims:
- To provide an opportunity for originality in developing and applying ideas in a research context.
- To provide comprehensive preparation for physicists to pursue academic research or project work in industry in any physics-related discipline.
- To provide a comprehensive understanding of some techniques of research, including the presentation of results.
- To provide the high point of the Physics Euromasters degree.

### Learning Outcomes:
Upon successfully completing the course students should:
- Be able to pursue academic research or project work in industry in any physics-related discipline.
- have a comprehensive understanding of some techniques of research
- be able to communicate their conclusions and the underpinning knowledge and rationale to both specialist and non-specialist audiences
- be aware of the importance of teamwork in complex scientific work
- have an impressive thesis on their project, which they can show at career interviews and discuss its content with confidence.

### Course Content:
This course is a research project occupying the final year of the two-year Physics Euromasters degree. Projects are associated with the research efforts of the Department and may be experimental, theoretical or computational. The course includes graduate-level research training in topics related to the project, through directed study, seminars and lectures.

### Teaching & Learning Methods:
One hour per week of guidance from the supervisor.
480 hours practical or theoretical work and 420 hours of private study, of which 60 hours spent in writing thesis and preparing talks.
40 hours seminars, colloquia and lectures, 260 hours directed study and self-study.

### Details of teaching resources on Moodle:
- Course details
- Seminar slides
- Additional notes
- Links to material of interest Links to past examination papers and selected outline solutions
<table>
<thead>
<tr>
<th>Key Bibliography:</th>
<th>As agreed with supervisor.</th>
</tr>
</thead>
</table>
| Formative Assessment & Feedback: | Students must plan and schedule their work in consultation with their supervisor and advisor.  
A two page progress report is submitted to the Programme Director and student give a brief presentation. A draft of the thesis is read by the supervisor, prior to submission.  
Associated with the research training activities there will be an element of continuous assessment. This will be assessed on a pass/fail basis and marks will not contribute to the final assessment. |
| Summative Assessment: | Thesis not exceeding 20,000 words - 90%.  
Oral presentation and viva - 10%.  
Deadlines – Progress report by end of January. Thesis submission by end of May. |

The information contained in this course outline is correct at the time of publication, but may be subject to change as part of the Department’s policy of continuous improvement and development. Every effort will be made to notify you of any such changes.
### Appendix 5: Members of staff and their areas of responsibility

<table>
<thead>
<tr>
<th>Posts within the department</th>
<th>Responsible person(s)</th>
<th>Room</th>
<th>Tel</th>
<th>email</th>
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<tbody>
<tr>
<td>Head of Department</td>
<td>Prof Pedro Teixeira-Dias</td>
<td>T116</td>
<td>3453</td>
<td>pedro.teixeira-dias</td>
</tr>
<tr>
<td>Department Manager</td>
<td>Tracy Webster</td>
<td>T115</td>
<td>3448</td>
<td>tracy.webster</td>
</tr>
<tr>
<td>Faculty Administrator</td>
<td>Gill Green</td>
<td>T114</td>
<td>3506</td>
<td>gill.green</td>
</tr>
<tr>
<td>(Undergraduate)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Faculty Administrator</td>
<td>Carmela Froggatt</td>
<td>T114</td>
<td>6265</td>
<td>carmela.froggatt</td>
</tr>
<tr>
<td>(Research Support &amp; Postgraduate)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Administrator</td>
<td>Claire Porter</td>
<td>T114</td>
<td>6464</td>
<td>claire.porter</td>
</tr>
<tr>
<td>(Thursdays only)</td>
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**Undergraduate Programme Directors**

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<tr>
<td>Director of Undergraduate Studies</td>
<td>Dr James Nicholls</td>
<td>W160</td>
<td>3444</td>
<td>james.nicholls</td>
</tr>
<tr>
<td>Deputy Director of Undergraduate Studies</td>
<td>Dr Stephen West</td>
<td>W261</td>
<td>6466</td>
<td>stephen.west</td>
</tr>
<tr>
<td>MSci/BSc programmes</td>
<td>Dr Chris Lusher</td>
<td>W052</td>
<td>3492</td>
<td>c.lusher</td>
</tr>
<tr>
<td>Study Abroad</td>
<td>Prof Glen Cowan</td>
<td>W262</td>
<td>3452</td>
<td>g.cowan</td>
</tr>
<tr>
<td>Socrates/Erasmus</td>
<td>Prof Glen Cowan</td>
<td>W262</td>
<td>3452</td>
<td>g.cowan</td>
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**Year Tutors**

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<tr>
<td>Senior Tutor</td>
<td>Dr Philipp Niklowitz</td>
<td>W152</td>
<td>3499</td>
<td>philipp.niklowitz</td>
</tr>
<tr>
<td>First Year Tutor</td>
<td>Dr Stephen West</td>
<td>W261</td>
<td>6466</td>
<td>stephen.west</td>
</tr>
<tr>
<td>Second Year Tutor</td>
<td>Prof Glen Cowan</td>
<td>W262</td>
<td>3452</td>
<td>g.cowan</td>
</tr>
<tr>
<td>Third Year Tutor</td>
<td>Dr Nikolas Kauer</td>
<td>W260</td>
<td>3500</td>
<td>n.kauer</td>
</tr>
<tr>
<td>Fourth Year Tutor</td>
<td>Dr Andrew Casey</td>
<td>W054</td>
<td>4351</td>
<td>a.casey</td>
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**Laboratory Organisers**

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<tr>
<td>Technical Operations Manager</td>
<td>Andy Alway</td>
<td>T113</td>
<td>3470</td>
<td>a.alway</td>
</tr>
<tr>
<td>Lab &amp; Stores Technician</td>
<td>Ian Murray</td>
<td>T232</td>
<td>3483</td>
<td>ian.murray</td>
</tr>
<tr>
<td>Teaching Lab Assistant</td>
<td>Charlotte Nedd</td>
<td>T232</td>
<td>3483</td>
<td>charlotte.nedd</td>
</tr>
<tr>
<td>First Year Laboratory</td>
<td>Dr Chris Lusher</td>
<td>W052</td>
<td>3492</td>
<td>c.lusher</td>
</tr>
<tr>
<td>Second Year Laboratory</td>
<td>Dr Veronique Boisvert</td>
<td>W259</td>
<td>3456</td>
<td>veronique.boisvert</td>
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<tr>
<td>Third Year BSc Project</td>
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<td>W052</td>
<td>3492</td>
<td>c.lusher</td>
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<tr>
<td>Third year MSci Laboratory</td>
<td>Dr Gregoire Ithier</td>
<td>W059</td>
<td>3459</td>
<td>gregoire.ithier</td>
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<tr>
<td>Fourth Year MSci Project</td>
<td>Dr Andrew Casey</td>
<td>W054</td>
<td>4351</td>
<td>a.casey</td>
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**Postgraduate Programme Directors**

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<tr>
<td>Director of Graduate Studies</td>
<td>Prof Jon Goff</td>
<td>W051</td>
<td>3485</td>
<td>jon.goff</td>
</tr>
<tr>
<td>Postgraduate Admissions</td>
<td>Prof Jon Goff</td>
<td>W051</td>
<td>3485</td>
<td>jon.goff</td>
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</table>
### MSc Physics Research
- **Prof Jon Goff**
  - Room: W051
  - Tel: 3485
  - Email: jon.goff

### MSc EuroMasters
- **Prof Jon Goff**
  - Room: W051
  - Tel: 3485
  - Email: jon.goff

### Student Facilities

<table>
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<td>IoP Representative</td>
<td>Dr Philipp Niklowitz</td>
<td>W152</td>
<td>3499</td>
<td>philipp.niklowitz</td>
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<tr>
<td>Educational Support Network</td>
<td>Dr Philipp Niklowitz</td>
<td>W152</td>
<td>3499</td>
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<tr>
<td>Representatives</td>
<td>Gill Green</td>
<td>T116</td>
<td>3506</td>
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</tr>
<tr>
<td>Colloquia</td>
<td>Dr Andrew Ho</td>
<td>T103</td>
<td>3196</td>
<td>andrew.ho</td>
</tr>
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<td>Special lectures</td>
<td>Dr Chris Lusher</td>
<td>W052</td>
<td>3492</td>
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<tr>
<td>Library Representative</td>
<td>Dr Tracey Berry</td>
<td>W153</td>
<td>3497</td>
<td>tracey.berry</td>
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### Careers

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<tr>
<td>Careers Liaison Officer</td>
<td>Dr Chris Lusher</td>
<td>W052</td>
<td>3492</td>
<td>c.lusher</td>
</tr>
<tr>
<td>Alumni Officer</td>
<td>Prof John Saunders</td>
<td>W055</td>
<td>3486</td>
<td>j.saunders</td>
</tr>
<tr>
<td>SEPnet Employer Engagement Officer</td>
<td>Claire Hepwood</td>
<td>T114</td>
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### Outreach

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<tr>
<td>SEPnet/Ogden Trust Outreach Officer</td>
<td>Anna Christodoulou</td>
<td>W155</td>
<td>6465</td>
<td>anna.christodoulou</td>
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### Safety

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<tr>
<td>Health &amp; Safety Co-ordinator</td>
<td>Andy Alway</td>
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<td>3470</td>
<td>a.alway</td>
</tr>
<tr>
<td>Deputy Health &amp; Safety Co-ordinator</td>
<td>Ian Murray</td>
<td>T232</td>
<td>3483</td>
<td>ian.murray</td>
</tr>
<tr>
<td>Laser Safety Officer</td>
<td>Andy Alway</td>
<td>T113</td>
<td>3470</td>
<td>a.alway</td>
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<tr>
<td>Radiation Protection Supervisor</td>
<td>Andy Alway</td>
<td>T113</td>
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<tr>
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<td>3483</td>
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### First Aiders

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<td>Ian Murray</td>
<td>T232</td>
<td>3483</td>
<td>ian.murray</td>
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</table>
Appendix 6: Physics Academic Staff and their contact details

To call from outside the College dial +44 (0)1784 44xxx for extensions 3xxx
+44 (0)1784 41xxx for extensions 4xxx
+44 (0)1784 27xxx for extensions 6xxx

Email addresses are of the form <name>@royalholloway.ac.uk

<table>
<thead>
<tr>
<th>Academic Staff</th>
<th>Research area</th>
<th>Tel</th>
<th>Room</th>
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<td>Dr Vladimir Antonov</td>
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<tr>
<td>Prof Andrei Seryi</td>
<td>Particle physics/JAI</td>
<td><a href="mailto:andrei.seryi@adams-institute.ac.uk">andrei.seryi@adams-institute.ac.uk</a></td>
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