

School of Physics

Honours Handbook

General information: page 2

Lecture courses: page 5

Research project requirements: page 8

Honours scholarships: page 13

GENERAL INFORMATION

Why do Honours in Physics?

If you are interested in a research career in physics, an Honours degree is realistically the minimum requirement, although a Pass degree will prepare you for many careers in physics and related areas. It is also necessary to have an Honours degree before proceeding to postgraduate study. By doing Honours you gain not only the benefit of studying physics to a higher level (with a wide choice of courses to be taken), but you also gain invaluable experience in undertaking a research project supervised by one or more members of staff, and producing a Report. Many students also end up publishing one or more scientific papers based on their Honours research.

The School of Physics at the University of Sydney is the leading Physics department in the country, with outstanding staff and students undertaking world-leading teaching and research. In the 2015 Excellence in Research for Australia (ERA) report, Physics at the University of Sydney was the only physical sciences school in Australia to receive a score in all eight categories, and achieved a top score of five in every category.

Our 120 staff and 160 postgraduate students conduct research across a vast range of interests from nanoparticles to clusters of galaxies and from theoretical modelling to laboratory experiments. With access to supercomputers, modern laboratory facilities and observatories, locally, nationally and internationally, the School of Physics is the premier environment for physics education and research.

During the Honours year you will be welcomed as a member of the active research group in which you undertake your project. You will be provided with office accommodation and access to the School's extensive computer facilities plus sophisticated software and (where relevant) laboratory and astronomical equipment.

Requirements for entry into Honours in Physics

For entry to Honours year in physics, all requirements for a completed undergraduate degree with a major in Physics must be satisfied. Furthermore, for normal entry into Honours a credit (65) average across Senior Physics, as well as a SciWAM of at least 65 or above is necessary. Students whose major is in Nanoscience are also eligible for entry into Honours Physics (there being no Honours Nanoscience pathway) with an equivalent requirement for credit average across senior units in the major. Before applying, all prospective Honours students are required to identify an Honours Project in an area in which they wish to pursue their research and to communicate with a prospective Honours Supervisor. Written agreement that the supervisor is willing to direct your research project is required: The supervisor has to send an email to you with CC to physics.honours@sydney.edu.au that he agrees to supervise your Honours project.

Students whose performance is below these boundaries have the option to finish their degree and progress to a Graduate Diploma (which covers the same material as Honours), although in special circumstances a case may be considered for entry to Honours, subject to support from the School of Physics based on 48CP of relevant intermediate and senior units approved by the School; these applications are considered on a case by case basis. External applicants (from outside U.Sydney or overseas) will have their academic records translated onto an equivalent scale.

Honours is typically completed on a full-time basis, but may be completed part-time over two years subject to approval by the School. The research project must be completed in two consecutive semesters. Mid-year entry (starting Semester 2) is available for Physics Honours. The same program is taken by candidates for the Graduate Diploma in Science (Physics) (details given below).

Applicants not meeting the entry requirements for Honours or the Graduate Diploma may be eligible for admission to the [Master of Philosophy](#) if they hold a three-year Bachelor's degree with at least a Credit average in Physics, and are expected to take the full set of [Honours coursework](#) requirements.

For further information on general entry requirements by the Faculty of Science to Honours refer to the [Faculty of Science Honours](#) site.
[Back to top](#)

Graduate Diploma in Science

Students who have satisfied the requirements for the BSc degree or equivalent but who are not eligible to enrol in the Honours course may instead enrol in the [Graduate Diploma in Science](#). This is a full fee paying course offered through the Faculty of Science and consists of equivalent work to that carried out by candidates enrolled in the Honours course.

The School of Physics will not, under normal circumstances, admit students with a SciWAM below 60 to the Graduate Diploma in Science.

Syllabus for Physics Honours

- Six lecture courses (or equivalent) chosen from the list at [Lecture Courses](#).
- A research project in Physics. These projects involve computational, experimental, observational, and/or theoretical research, and your work is assessed by a 30-minute talk and a 40-page (approximately 9000-words) report. The projects are supervised within the research groups of the School of Physics, although these groupings are flexible and students may often have projects which span interests in more than one research area. A more detailed listing of research areas and specific topics is given in [Research Projects](#).
- With approval from the Honours Coordinator, projects may be jointly supervised by researchers from groups outside the School of Physics, including other University Departments, the CSIRO, etc. The primary supervisor however has to be at the School of Physics.
- In February there is an induction to introduce students to their Honours year, including a compulsory instructional course on Workplace Health and Safety (WHS) and a library information session on database management and bibliography tools. All Honours students are expected to attend School of Physics Colloquia.

Assessment

Half of the total marks available are allocated to coursework and half to the research project. The mark for the research project is obtained by combining the mark given by the student's own research group, a mark based on the assessment of the report by external examiners from other research areas in the School of Physics, and a mark for the talk which counts 10% to the project mark.

Honours is awarded at five distinct levels: First Class Honours with medal; First Class Honours; Second Class Honours, first division; Second Class Honours, second division; and Third Class Honours. Exceptional performance is required for award of a medal. The other honours

grades are awarded based on the student's total mark in the honours year; first and second class honours are also subject to conjunctive grading, i.e. a certain minimum mark must be met in both the coursework and research project components.

Details of the assessment process are given on the [Research Projects page](#).

Enrolment, Scholarships, and Financial Assistance

Please contact prospective supervisors as early as possible to discuss the project. Students are free to choose their projects and supervisors, subject to availability. Outlines are given in the [Research Projects](#) section of the physics Honours webpages.

However, you must still enrol via the University's formal enrolment channels. Further information on enrolment procedures can be obtained by contacting the Faculty of Science office.

The Units of Study for Physics Honours are PHYS 4011, PHYS 4012, PHYS4013 and PHYS 4014. Each are for 12 Credit Points and you need to enrol in two Units of Study per Semester if you are a full-time student or one if you are enrolled part-time. Our Honours Program of courses and project cannot be mapped exactly onto these Units, and you will receive a single mark for all 4 units - your Honours mark - at the completion of the program.

The School of Physics and the University of Sydney offers a number of scholarships and other forms of financial assistance for students undertaking Honours. Details specific to Honours Physics can be found on the [Honours Scholarships webpage](#). Further details can be obtained by consulting the [Scholarships Office](#).

What if you have a Problem?

If any problems arise that impede your progress, the University has procedures to ensure that you are not disadvantaged. You should see the Honours Coordinator and/or one of the University student assistance services as soon as difficulties arise. Please don't try to "tough it out" or just drop out - issues can usually be resolved to allow you to complete Honours without harming your results.

For medical conditions that cause your performance to be impaired, or force you to miss time, you should obtain a medical certificate immediately (legally, they can't be given retroactively) to be submitted with a Special Consideration form to the Physics Office. Personal/family difficulties that affect your performance are also grounds for Special Consideration and you may wish to consult the Counselling Service to determine the best course of action. Student Services (in the Education Building) can also assist you with financial, accommodation, learning, disability, international student, and other issues that might arise.

LECTURE COURSES 2018

- Physics Honours students must complete **six full-courses** from those listed below, subject to the constraints indicated. **Students should self-select their courses for the year through [Blackboard](#) within two weeks of the start of lectures.**
- A **full-course** is typically **20 lectures**. **Half-courses** will be **10 lectures** in length. It is up to you how you arrange your six courses. It is advised, however, that you take a heavier load in your first semester, so that you have more time to devote to your project in the second semester. Recommended options are: 4 courses in first semester and 2 courses in second semester, 3.5 courses in first semester and 2.5 in second semester, or 3 courses in each semester. You should consult with your supervisor to gauge how your research project load is distributed.
- Written examinations scheduled for courses, both **full** and **half** length, will be held as usual at the end of semester typically in week 14 (stu-vac) and week 15. However, mid-semester tests may be held as part of the assessment for courses, to assist students with gauging their progress.
- Timetables and Course Outlines will be posted on the [Blackboard](#) page at the start of each Semester. Schedules are set to avoid clashes with Senior Physics options and Mathematics Honours courses, where possible.

Outline and Program of Courses	
Semester 1	Semester 2
QFT - (Introduction to) Quantum Field Theory Archil Kobakhidze	QN- Quantum Nanoscience Stephen Bartlett
AET - Advanced Electromagnetic Theory Serdar Kuyucak	PCBAP - Particle Cosmology & Baryonic Astrophysics Joss Bland-Hawthorn; Archil Kobakhidze
AOP - Advanced Optical Physics Ben Eggleton; Andrea Blanco Redondo; Stefano Palomba	PSM - Physics of the Standard Model Kevin Varvell
GR - General Relativity Andrew Doherty	BIO - Biophysics Serdar Kuyucak
BRI - Bayesian Reasoning and Inference (half-course) Peter Tuthill	ND - Neurodynamics (half-course) Pulin Gong
TLP - Teaching & Learning Physics (half-course) Manju Sharma	KT - Kinetic Theory(half-course) Martijn De Sterke

<p>NP - Nuclear Physics Bruce Yabsley</p>	<p>MLDI - Machine Learning and Data Inference (<i>half course</i>) Peter Tuthill</p> <p><i>New course in 2018, details TBA</i></p>
	<p>SP - Space Physics (<i>half-course</i>) Iver Cairns</p>

SAFETY COURSE

A **compulsory** session for students on Safety and Resuscitation is held on the Honours Induction Day. This course is not for credit.

OTHER COURSE POSSIBILITIES

Students must take at least 4 out of their 6 courses from the above table "Program of Courses". Their remaining courses could be selected from the below:

1. Senior Physics Options

Students may choose one or possibly two [Senior Physics](#) 'options' lecture courses (not previously taken). Any Senior Physics option chosen must be taken at the Advanced level. Students who have come from another University must consult the [Physics Honours Coordinator](#) regarding their choices.

Each Senior Physics lecture [module](#) is credited as a half-course towards your Honours requirements.

2. Coursework Masters Courses

Honours students may, with permission from the [Physics Honours Coordinator](#), take additional courses offered in the Masters program if appropriate. For more information students should contact the relevant Postgraduate Coursework Coordinator.

3. Courses in other Disciplines

Students may take courses offered by other departments, with the approval of the Physics Honours Coordinator. In the past approved courses have been taken from disciplines including Chemistry, Engineering, History & Philosophy of Science, Biochemistry and Education.

In particular, students may include courses from Honours or Senior Level (Advanced) from the School of Mathematics & Statistics, subject to the same limitations for Physics and Senior level courses given above, and with the approval of the [Physics Honours Coordinator](#). You should be aware that all Senior Mathematics Units of Study are worth 6 Credit Points (and count for 1.5 courses in your Honours Program). Honours Mathematics courses are equivalent to either 4 or 6 Credit Points; please discuss any such course you may take with the Honours Coordinator, so that you are credited appropriately.

If you choose a Senior Physics option or a course from another Department, you do not need to enrol separately for that subject. The assessments are handled internally.



Enrolment in Honours Units of Study satisfies the Faculty and University requirements. However you need approval to sit the course from both the lecturer and the Honours coordinator.

4. Overloading

In case of overloading, the 6 best courses are counted towards the coursework mark subject to the requirement that at least 4 physics Honours courses contribute to the final coursework mark.

HONOURS RESEARCH PROJECT REQUIREMENTS

General Information

Progress and outcomes in your project will be assessed by a variety of means, some of which are designed to ensure that your work proceeds smoothly, others which carry a mark value. The research component of the Physics Honours program counts 50% of the final mark. The sub-division of this assessment is given below.

- At the start of the project you and your supervisor will write a brief Research Plan, including a list of equipment/data/programs needed, a proposed plan of expected progress, and a statement certifying the supervisor's availability and the feasibility of the project. This Research Plan is due at Student Services at the end of the second week of your first semester of the Honours project. In addition, you and your supervisor will write a data retention plan to clearly specify how data is made available beyond your Honours studies.
- A draft Introduction and Literature Review (see below) will be due two weeks after the start of the 2nd Semester of your project, with a copy going to the Honours Coordinator, along with a revised Research Plan (if appropriate).
- A 20-30 minute talk on your project will be presented prior to the report deadline and will be scheduled by the Physics Office. **ASSESSMENT: 10%**.
- A draft Report should be submitted to your supervisor approximately one month before the final version is due.
- The final Report will be submitted at the end of week 12 of the second semester of your Project. **ASSESSMENT: 90% (composed of mark from research group and at least two external examiners in the School of Physics).**

Report Requirements

Students write an Honours research project Report. It should be written so that it can be understood by a physicist who is not a specialist in the subject. Such a person should be able to acquire a good understanding of the subject from your Report. As the ability to write clearly is an important skill for a scientist, it is desirable that you devote considerable effort to the clarity of your expression and to the organisation of your Report. Hence, you must not wait until the second half of your second semester to start thinking about it.

Guidelines for preparation are provided below. Reports that do not comply with these Guidelines will be returned for re-writing.

Format

More detailed explanations are given below, but the layout of your Report (giving maximum number of pages allowed) should be as follows:

Section of Report	Page Number and Comments
Title Page	Page 1

Abstract	Page 2 (100 - 200 words)
Statement of Originality	Page 3 (format given below, to be signed)
Acknowledgements	Page 3 (general statement)
Statement of Contribution of Student	Page 3 (does not count in 40-page limit)
Table of Contents	Page 4 (only counts as 1 page in 40-page limit)
Introduction, and Survey of Literature	Approx. 6-10 pages (details below)
Main body of report	(Sections as appropriate)
References	Page 40 (only counts as 1 page in 40-page limit)
Appendices	Not part of 40-page limit

The text of the Report must not exceed a maximum of 40 pages in total length. In no circumstances will permission to exceed the page limit be granted; penalties will be imposed for overlong Reports. If absolutely necessary, additional material may be included in Appendices. However, Appendices will not necessarily be read in detail by the examiners. The typeface used must be 11 pt or 12 pt and the margins must be at least 20 mm wide on all sides of the page (the page number may be put in the marginal area, clearly away from the edge of the paper).

The main body of text should be preceded by a *Title page* (page 1), a page with an *Abstract* 100 - 200 words long (page 2), a page containing a *Statement of Originality* (see below) together with *Acknowledgments* and a *Statement of Contribution of the Student*, which explain exactly what parts of the work are yours and what roles were played by others (page 3). You may place the *Statement of Contribution of the Student* on a separate page, but it will not be counted as an extra page in the 40-page limit. The last part of your preamble should be a *Table of Contents* (page 4), and if this takes more than one page, only one page counts toward the limit. **These 4 initial pages are included in the 40-page limit.**

You must acknowledge all assistance from staff and others under the headings *Acknowledgements* and *Statement of Contribution of the Student* on the 3rd page of the report, explaining their role briefly but precisely. You may give a general statement thanking people in the *Acknowledgements*, but the *Statement of Contribution of the Student* must be more explicit. **You must give details of contributors to the project. For example, were you part of a team who performed the experiment, did someone write parts of the computer code, take the observations, build some of the apparatus, or do some of the analytic work?** The reason for this *Statement* is to assist the assessment of the Reports, which are typically written in the third person like research publications. You are also required to

provide on this page a signed and dated statement of originality of the form: *I certify that this thesis contains work carried out by myself except where otherwise acknowledged.* Digital/scanned signatures are allowed.

The text itself should be divided into sections with appropriate headings. After a brief *Introduction*, you are asked to present a section of about 8 pages which surveys the subject of your project and explains how the topic of your work fits into the bigger picture (this section could be given the heading *Survey of the Subject*, *Literature Review*, or similar). To prepare this you will need to consult the literature, a task you are advised to undertake early in the year. A section giving the outline, motivation for your project and significance of your results should be included here. A draft Literature Review is to be submitted to the Honours Co-ordinator (and your Supervisor) early in the second semester of your project work.

Diagrams (with captions) should be inserted in the text at the appropriate locations.

References within the text should be indicated either by numbers in square brackets (in which case the list of references at the end of the Report should be in order of reference number) or by authors' names and year (in which case the list of references should be ordered alphabetically by name of first author). If the references, which should be listed at the end of the Report, take more than one page then **only one page will count towards the 40-page limit.**

You may wish to use a physics journal as a guide to format for references and other aspects of the thesis. Not all journals follow the same rules; however any major journal would provide an acceptable guide. Suggestions: *Astrophysical Journal*, journals published by the American Physical Society (e.g. *Physical Review*, *Journal of Applied Physics*, etc.), journals published by the Institute of Physics (*Journal of Physics A*, *B*, *C*, etc.).

Computational projects that involve the writing of computer code as a significant component of the research should include the relevant computer code in the appendices.

Presentation

A high standard of presentation is required, using a word processor that can produce scientific notation. The document preparation system LaTeX is recommended. Ask staff or students in your department how you can obtain access to LaTeX and become familiar with it early in the year. You may also use Microsoft Word if you prefer. It is advisable to discuss the format of your Report with your Supervisor. An electronic version of a template in each of these two major format styles is available. The facilities of the School can be used for producing diagrams, photographs, and for photocopying.

Assessment of Research Projects

Criteria for Talk Assessment

Broadly, each 20-30 minute presentation will be assessed on the basis of form (the way the material is organized and presented), content (the extent of the material covered), and style (your personal delivery of the presentation - confidence, responsiveness to questions, etc.), with approximately equal weightings.

Criteria for Report Assessment

Some of the criteria for this assessment are listed below. The external examiners will in general not be able to judge criterion (4) and the first part of (3) in their assessment.

1. Understanding

- Perception of the problem.
- Applicability of the method used.
- Experimental or theoretical insight.

2. Originality

- What new ideas and novel methods were used.
- What were the modifications and adaptations of existing methods.

3. Effort

- A judgement of the diligence of the student.
- The content of the Report.

4. Independence

- How much assistance did other group members and the supervisor give.

5. Professionality

- Comprehensive literature survey.
- Critical judgement of data/results and their significance.

6. Presentation

- Ease of reading.
- Clarity of presentation.
- Informative introduction and conclusion.

To standardise grades, the examiners will refer to the Criteria for Honours Grades given below.

Conjunctive Grading

The criteria for the five distinct honours grades are given in the next section. For grading of the honours year as a whole, the School applies a cutoff on the total mark across the year; the first and second class honours are also subject to conjunctive grading. This means that both (1) the total coursework mark and (2) the research project mark should also satisfy a minimum standard. The standards are as follows:

H1 (first class honours): total mark ≥ 80 ; coursework mark ≥ 78 and project mark ≥ 78

H2.1 (second class honours, first division): total mark ≥ 75 ; coursework mark ≥ 70 and project mark ≥ 70

H2.2 (second class honours, second division): total mark ≥ 70 ; coursework mark ≥ 65 and project mark ≥ 65

H3 (third class honours): total mark ≥ 65

Criteria for Honours Grades

95-100

Outstanding First Class quality of clear Medal standard, demonstrating independent thought throughout, a flair for the subject, comprehensive knowledge of the subject area and a level of achievement similar to that expected by first rate academic journals. This mark reflects an exceptional achievement with a high degree of initiative and self-reliance, considerable student input into the direction of the study, and critical evaluation of the established work in the area.

90-94

Very high standard of work similar to above but overall performance is borderline for award of a Medal. Lower level of performance in certain categories or areas of study above.

*NOTE: An honours mark of 90+ is a necessary, not a sufficient, condition for the award of the Medal. Examiners are referred to the Academic Board Guidelines on the award of Medals found in the general policy pages at the front of the Examiners' Manual.

80-89

Clear First Class quality, showing a command of the field both broad and deep, with the presentation of some novel insights. Student will have shown a solid foundation of conceptual thought and a breadth of factual knowledge of the discipline, clear familiarity with and ability to use central methodology and experimental practices of the discipline, and clear evidence of some independence of thought in the subject area. Some student input into the direction of the study or development of techniques, and critical discussion of the outcomes.

75-79

Second class honours, first division - student will have shown a command of the theory and practice of the discipline. They will have demonstrated their ability to conduct work at an independent level and complete tasks in a timely manner, and have an adequate understanding of the background factual basis of the subject. Student shows some initiative but is more reliant on other people for ideas and techniques and project is dependent on supervisor's suggestions. Student is dedicated to work and capable of undertaking a higher degree.

70-74

Second class honours, second division - student is proficient in the theory and practice of their discipline but has not developed complete independence of thought, practical mastery or clarity of presentation. Student shows adequate but limited understanding of the topic and has largely followed the direction of the supervisor.

65-69

Third class honours - performance indicates that the student has successfully completed the work, but at a standard barely meeting honours criteria. The student's understanding of the topic is extremely limited and they have shown little or no independence of thought or performance.

HONOURS SCHOLARSHIPS

All eligible students should apply for the [University Honours Scholarship](#). **Please note that Honours students can hold only one 'major' scholarship.** If a student holds a University Scholarship or is awarded a University Honours Scholarship they are not eligible for a School of Physics Honours Scholarship.

University Honours Scholarships

The University of Sydney offers scholarships for students of sufficient merit entering Honours, whether they commence in first semester or second semester. These scholarships are available only to Australian citizens and permanent residents. Mid-year entry students are eligible; applications are only accepted once per year, so **mid-year entry students apply at the end of the current year** before commencing their Honours degree.

The University of Sydney Honours Scholarships are valued at \$6000.

The application form will be available for download from August to December each year from the [Honours Scholarship website](#).

School of Physics Honours Scholarships

The School of Physics will offer scholarships for students of sufficient merit entering Physics Honours on a full-time basis, whether they commence in first semester or second semester. These scholarships are available only to Australian citizens and permanent residents. *Holders of a University of Sydney Honours Scholarship, University of Sydney Scholarship with Merit or University of Sydney Outstanding Achievement Scholarship are not eligible for the School of Physics Honours Scholarship.*

The School of Physics Honours Scholarships are valued at \$3000.

Applicants who completed Senior Physics at the School will be **automatically eligible** for scholarships as soon as they enrol for Physics Honours, while applicants from outside the School should apply to the [Honours Coordinator](#), specifying their research field or fields of interest in the School, and enclosing a CV with complete academic record and any supplementary information relevant to their aptitude for research.

In addition, for students newly commencing at the School from interstate or outside the Sydney metropolitan area, approved relocation expenses will be reimbursed (up to a limit of \$2000). *Original receipts must be provided.* Approved expenses may include removalist fees, petrol costs, storage costs and rental bond payments, but not including rent. The relocation allowance will be given to eligible Honours students, whether or not they receive an Honours scholarship.

Applications for commencement in semester 2 should be lodged before **end of June**.

Applications for commencement in semester 1 should be lodged before **end of January**.

Medical Physics Honours Scholarships

The Radiation Oncology Medical Physics (ROMP) research group at Liverpool and Macarthur Cancer Therapy Centres offers a scholarship to undergraduate students studying physics and undertaking a Medical Physics Honours project with the research team.

This research team consists of a number of research physicists together with involvement from clinical medical physicists, research students and collaborations with universities and other hospitals. Our major research project is the development of a Magnetic Resonance Imaging – Linear Accelerator (MRI-linac). This is one of only a few other similar developments worldwide and will enable real time imaging of patient anatomy during radiotherapy treatment and the potential of improved cancer targeting and a reduction in treatment side effects. Other research areas include; medical imaging, radiobiology, treatment planning, novel radiation dosimetry, magnetic resonance imaging, electronic portal imaging, big data and clinical trials.

The establishment of these scholarships is supported by the South Western Sydney Cancer Services Research Executive.

The intention is to encourage high quality students to enter the area of Medical Physics and to further research collaborations between the ROMP department and universities. Research projects will be available at both Liverpool and Macarthur Cancer Therapy Centres and the Ingham Institute and will be integrated with the research aims of the ROMP department and the university requirements.

The scholarship is for \$5,000 for one year and one new honours scholarship may be offered each year, however the number of successful scholarship applications awarded in any given year may vary.

Application information for the following year's scholarship will be circulated to students from August of each year and applications will close on 1 November each year.

For further information please contact Dr. Michael Jameson, Physicist, Liverpool Cancer Therapy Centre: [Michael Jameson](#), Physicist, Liverpool Cancer Therapy Centre.

International Student Scholarships

Various scholarships are available to International students entering Honours. Please see the [International Scholarships website](#) for more information.

For further information contact the [Physics Honours Coordinator](#).