

**UNIVERSITY OF CANTERBURY**  
DEPARTMENT OF PHYSICS AND ASTRONOMY

**INTRODUCTION TO PHYSICS/ASTRONOMY RESEARCH**

PHYS 391, ASTR 391

## **1. INTRODUCTION**

The PHYS/ASTR391 course is a 14 point course consisting of a small research project. It may be used as a credit towards the 360 points total for a B.Sc. but does not count as part of the compulsory 56 points required for a B.Sc. subject major. Similarly it may count towards the 360 points total required for entry to the fourth year of B.Sc.(Hons) but not as part of specific prerequisites for Honours entry listed in the Department handbook.

The project may be taken in semester 1, semester 2, or in Summer Term. It will generally involve about 150 hours lab/field work.

A list of available topics, with contact details for supervisors, may be found on the web at the URL:

<http://www.phys.canterbury.ac.nz/courses/300/phys390/>

Students should negotiate a topic with the relevant supervisor.

It is important to note that although the prerequisite for doing a PHYS/ASTR391 is having passed 44 points of PHYS200 papers, not every project is suitable for every student, and acceptance into the course is entirely at the discretion of the supervisor and HOD. For example, some projects may require students with a background in electronics, while others may require a high level of computation or of mathematical knowledge. Some projects may only be suitable for students who have already passed particular 300-level papers. In each case, it is up to individual supervisors to assess whether a particular student has the background needed for the project in question.

## **2. ASSESSMENT**

Assessment will be 80% on a written report, and 20% on an oral presentation. The report will be assessed by (i) the student's project supervisor, and (ii) by another member of the academic staff. The oral presentation will be given to a small audience – generally members of a research group working in the relevant area – and including both academics responsible for assessing the project. For consistency, the final grades will be reviewed at a meeting of all examiners involved, at which all reports and assessments will be compared.

Some of the qualities all the examiners will be looking for in assessing the project are: thoroughness; scholarship; structured presentation; level of understanding of physical principles; familiarity with the literature; new results; amount of effort; perseverance; quality of the final presentation (accuracy and clarity); achievement of the project goals; and accuracy in acknowledgement of other research. Project reports must include a discussion of uncertainties and/or validity of assumptions.

Other qualities which are more relevant at 400– or thesis level would count as a bonus, though these are not emphasized for introductory 300-level projects: namely, independence from the supervisor, originality, and initiative.

### 3. WRITTEN REPORT – STYLE AND LAYOUT

The project should be written and typed to the standards expected of typescripts submitted for publication in journals or for presentations as theses. To train students to abide by the format requirements for an article or a thesis, the layout is specified below. A sample LaTeX report template is provided on the main webpage, both as the original TeX file and in processed form.

The style rules of the Journal of Physics (UK) should be used. Any article in any of the volumes of the Journal of Physics, A, B, C...G may be consulted for layout. Certain issues contain instructions on style for authors on an inside cover. Also Journal of Physics "Notes for Authors" is available in Room 805.

As adapted for our projects, the Journal of Physics rules will mean that reports will comprise (in the following order):

\* *Title/Abstract page*: A single page containing:

(i) title; (ii) student's name; (iii) supervisor's name (iv) course code (v) date; (vi) the abstract (namely a concise summary of the project of about 100 words, maximum 250 words)

\* *Main sections* from Introduction to Conclusion (with new sections either following on or on new pages). Section divisions in between the Introduction and Conclusion are the choice of the student, and really depend on the nature of the project. Break it up into whatever seems logical chunks that help a reader who may wish to quickly refer to one section without necessarily reading the whole report. Figures and tables should be located within each section, where first cited, and should each have an explanatory caption.

\* *Acknowledgements* (generally one or two sentences, not on a new page)

\* *Appendices* (if applicable)

\* *References* (set out as in the Journal of Physics but including in italics the titles of each journal article)

All pages from the start of the Introduction should be numbered in Arabic numbers (1,2...) and the Title/Abstract page unnumbered. The numbered pages of the report from the beginning of the Introduction to the end of the References, but excluding Appendices, should comprise a total of about 10, and *not more* than 15 pages, typed pages being A4 in 12-point type (e.g. Computer Modern, or similar) with a 3cm left margin for binding and 1.5cm margins elsewhere. These specification correspond to about 600 words on a page of full text, i.e., with no equations, diagrams or sub-headings. Folded inserts and other devices which increase the quality of material will be counted according to their equivalent number of pages of information.

A word processing package system should be used to type the project. Students familiar with Microsoft Word should find it adequate. However, those who are going on to further research in physics may find it a useful experience to prepare the report using the typesetting system LaTeX: LaTeX is ideal for physics as it handles mathematics well – a sample report template is provided on the main PHYS391 web page. It contains many tips for beginners in LaTeX.

This may seem to be a fairly restricting format. However, in your future careers you will face more severe constraints. So remember that over-length reports will be penalized.

The main sections should include an Introduction and a Conclusion. Despite being similar in format to a journal article the report should normally be less technical, less cryptic and more expository than a typical research paper.

The Introduction should state the purpose of the research in the context of adequate background material and might conclude with a brief section-by-section summary of how the work is to be reported in the following sections. In it, or perhaps in a separate section of the report, there should be a short survey of the literature showing where the student's work fits into the general picture of the research field. Significant problems encountered and their solutions may require a mention even if the solutions were not entirely satisfactory (such as simply looking for alternative problems).

There should be statements somewhere in the Report (and the Abstract) of the original goals; of what was achieved; what new results were obtained; and where appropriate, acknowledgement made that certain parts were done with the assistance of others. This may be in addition to the blanket acknowledgements given in a section at the end.

The Conclusion, like the Introduction, should also be somewhat less technical than the sections in between.

Appendices too frequently contain material that belongs in the body of the text or vice versa. One criterion is to only append material that would seriously break the logical flow of the main text even if it formed a whole subsection or sections. Examples are units, notation and conventions or a reference list of the properties of some concept or quantity if it cannot easily be made into a Figure or Table or embedded in the text.

#### **4. PRODUCTION OF THE REPORT**

The production of the report is the student's responsibility. Copying and binding of the final manuscript will be done by the Department.

Three copies will be made at the Department's expense - except that four copies of Astronomy projects will be made, with the fourth copy being placed in the library at Mount John. One copy will be returned immediately to the students for preparing their talk. The original and two other copies will eventually go to the Department's collection, the student's project supervisor and the students' 400-level room, 805.

## 5. ORAL PRESENTATION

Each student will present a short talk (10-15 minutes) on the Project, shortly after submission of the report. The talk will be somewhat less formal than the corresponding talks for 400-level projects. Nonetheless you will still find it a valuable experience. Some of the aspects sought by assessors are: an outline of the key features and main results; clarity; balance; well-chosen and easily-read illustrations; logical structure; appropriate technical level. Choose the level of the talk as being an exposition to your fellow students. A practice run beforehand is strongly recommended. You may also like to read the article on “advice to beginning physics speakers”, *Physics Today*, p42, July 1991.

## 6. DUE DATE

*Summer Term – ASTR/PHYS391:* You must submit the completed manuscript to the Physics and Astronomy office by the end of enrolment week:

Friday, 5.00 pm

It is important that you achieve the final hand-in date. A late submission other than for recognized medical or compassionate reasons will be penalized. Arrangements for project talks will be notified by email.

Mike Reid, 300-level Coordinator, Room 606

October 2008