



University of Glasgow | School of Physics & Astronomy



# Astronomy Laboratory

*Course Information Guide*

**ASTRO4003P Astronomy Skills 1**

**ASTRO4004P Astronomy Skills 2**

## 1. Honours A345HM Laboratory (ASTRO 4003, ASTRO 4004)

Date/time: Tuesdays, semester 2, 1130–1700

Credits: 15

Degrees: Combined Astronomy & Physics (BSc)

Assessment: lab report and performance in the laboratory (10 credits), 3<sup>rd</sup> year A3H oral seminar (5 credits), 4<sup>th</sup> year A4H written report (5 credits)

## 2. Introduction

The projects are designed to give you high-level experience in observational, experimental and computational astrophysics, and to develop your skills in teamwork and problem-solving. Most of the course time will be spent during the day (Tuesdays, semester 2, 1130–1700) at the Observatory, but some observational work may need to be done at night or at other times, depending on the projects you choose. You can work at the Observatory at other times by arrangement. These honours labs represent a step-change in your experience of practical astronomy work. They are closer to real research projects than were the A1/A2 labs, and are therefore less prescriptive – by design you will not be given a step-by-step instruction sheet, although demonstrators will always be at hand to discuss your project with you. As a result you will probably experience both the highs and lows of any research scientist feeling their way through a new topic.

There is also an oral seminar in year 3 and a written seminar in year 4 which contribute 5 credits.

## 3. Intended learning outcomes

The intended learning outcomes of the A34 laboratory course component are:

As part of a small group, the student should be able to:

- Identify, with the assistance of the laboratory head, a (set of) clear scientific question(s) to be answered by a combination of experiment and/or observation and/or computational work, depending on the type of project;
- Discuss, analyse and plan a path of investigation, and make an appropriate timetable for completion of all individual and group tasks, including final reports;
- Contribute to the management of the group (including division of tasks) for efficient and amicable working;
- Implement a strategy for reviewing and updating the goals and direction of the research in accordance with progress and problems;
- Evaluate the achievements of the work against the goals set at the beginning of the project and revised during its progress.

As an individual the student should be able to:

- (Computational projects) Demonstrate proficiency in programming in a high level computer language or astronomical software package, and apply this to the solution of a theoretical or data-analysis problem;
- (Practical projects) Use professional-level laboratory bench equipment, and construct small devices where necessary, to investigate physical phenomena

or use sophisticated astronomical observing equipment and acquire data from an astronomical source;

- Analyse and critically interpret experimental or computational results, including their uncertainties;
- Keep a running log of individual work and team progress, and produce a succinct and meaningful interim report where required;
- Critically review and evaluate individual achievements against the overall project goals and if necessary negotiate adjustments to goals or working patterns to allow completion of group and individual tasks, including the final report;
- Write a detailed individual technical report on work undertaken, synthesising the results of all group members, and including background information and theory, a description of equipment and procedures, data and data analysis, and results/conclusions.

For the seminar (written/oral) component:

For the written component, the student should be able to:

- Organise and structure a scientific review;
- Write a concise but thorough report, including diagrams and figures, on the chosen topic;
- Fully reference the review and prepare a detailed reference list.
- Use online and journal resources to perform a literature search on a chosen topic of astrophysical interest;
- Assemble a relevant body of current and review material on this topic, drawn from reputable, predominantly peer reviewed, sources;
- Survey the literature to plan the scope of the verbal presentation and (if required) the written report to be made on it;
- Form opinions on material collected, including an identification of the most significant past results and recent developments in the field.

For the seminar presentation component, the student should be able to:

- Prepare and give a well-researched scientific presentation on an important topic in astronomy to an audience of staff and peers, using appropriate audio visual aids;
- Provide a mix of theory, observation and technical material appropriate to the topic, from a variety of referenced sources, demonstrating discrimination in the material presented;
- Set the topic in its wider context, discussing related current astrophysical research, and historical aspects of the field;
- Answer questions from the audience on the material presented.

## 4. Structure of the laboratory

There are different requirements depending on your chosen degree path. These are detailed in the A345 course guide but are briefly described below:

### ***BSc Combined designated***

Astronomy Honours Labs 3

Year 3: AstroSkills 1 (10 credit honours astronomy laboratory project and 5 credit oral seminar)

### ***BSc Combined Honours***

Year 3: AstroSkills 1 (10 credit honours astronomy laboratory project and 5 credit oral seminar project)

Year 4: AstroSkills 2 (10 credit honours astronomy laboratory project and 5 credit written seminar project)

### ***MSci Combined Honours***

Year 3: AstroSkills 1 (10 credit honours astronomy laboratory project and 5 credit oral seminar project)

Year 4: AstroSkills 3 (20 credit module comprising one 15 credit astronomy Honours project and a 5 credit project viva. The project will feature an extended report) Year 5: 40 credit M-project.

## **5. Organisation**

You will carry out the work at the Observatory on Tuesdays 1130–1700 in semester 2. Depending on the kind of project you undertake you may need to make observations at night at a telescope, and the time this takes is included in the schedule for the project. You will get support and advice from staff, technicians and demonstrators during your laboratory sessions. As your project proceeds, there will be a more formal assessment of progress. Half way through the project we require you to produce a short interim report (< 1 page) through Moodle, describing the goals of the project, your progress so far and the work to be done. The Lab Head will discuss the report with you. It will not form part of the project assessment, but is mandatory to check progress.

Very important: As a matter of good working practice, and to help with the assessment of your progress, it is very important that you keep a weekly log of what you achieve in a PERSONAL laboratory notebook. Also make sure that you have a copy of all the data that your team gathers. It is your responsibility to submit an individually written report on the project. Do not share text or diagrams without explicit reference to the original author.

## **6. Assessment**

Each project is assessed on the University's 22 point scale (see academic calendar for a descriptor and the end of this course guide). Bonus adjustments will be made to the assessment to reflect any special initiatives and innovations that you have introduced. The individual contributions of each student will be noted and assessed separately. Your reports are made available to the External Examiner, and the marks will contribute to your overall assessment both in 3H/3M and 4H/4M (see the current A345 Student Handbook).

The following highlights the assessment structure:

Reports received ASTRO4003P, ASTRO4004P

- Double marked (2/3 total mark)
  - Statement of work read and discussed with demonstrator (1/3 total mark)
  - Combined (2/3+1/3) final mark on 22 point scale
- 
- The oral and written seminars are marked by academic staff members. The written seminars are double marked and the oral seminars typically have 3 markers.

## 7. Feedback

You will receive formal feedback from each submitted report, and further informal feedback will be supplied by the lab head on request. All reports that contribute to your degree classification are retained for inspection by the examining committee, but they can be collected from the lab head on request once you graduate. Remember also that during the lab you will continually receive feedback from the project demonstrators.