Astronomy and Astrophysics
School of Physical and Chemical Sciences

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

General Course Information

July 2025

ASTR211-25S2 – Observational Astronomy

0.125 EFTS 15 Points Second Semester Course

Lecturer/Course Coordinator
Dr C.Clare Worley
Room 622A Julius von Haast
clare.worley@canterbury.ac.nz

Lecturer
Dr Joe Masiero

Tutors and Assistants
Muhammad Fajrin (muhammad.fajrin@pg.canterbury.ac.nz)
Jazmin Garvey (jga153@uclive.ac.nz)

General Overview

In this hands-on course, students will participate in computer labs and carry out all of the assessment by way of practical assignments. The syllabus will include: photometry, spectroscopy, image and spectrum processing methods, telescopes, CCDs, coordinate systems, astrometry, and time. Students will undertake astronomy research that includes a field trip to the University of Canterbury Ōtehīwai Mt John Observatory (UCMJO) at which students are expected to use the instruments and telescopes to obtain scientific observations for the research projects.

Pre-requisites

(1) ASTR112; (2) COSC131 or COSC121; (3) PHYS285
Before the course begins, please revise PHYS285/COSC131/121 material. In particular, the use of Jupyter notebooks, and computation of measurement uncertainties.

Course Description

The aim of this course is to give students experience in practical observational astronomy. The course takes place during Semester 2. During the course students will acquire the skills to perform basic astronomical research using data obtained from optical telescopes. The course has 12 lectures and a weekly computer lab/tutorial during the first half of the semester, in preparation for the observing field trip to the UCMJO during the mid-semester break.

By the end of the first half of the semester the students will have:

- submitted data processing reports and final reduced data for archived: 1) photometric observations; 2) spectroscopic observations,
- become acquainted with the available telescopes and instrumentation at UCMJO, and associated data reduction software,
- identified at least one suitable observing project to be carried out at UCMJO,
- prepared an observation plan to be carried out at UCMJO, and
- written an observing proposal for the identified project.

The field trip runs during the mid-semester break. During the field trip the students will be trained and supervised in the use of the telescopes and instruments at UCMJO. They will obtain observational data across all the observing proposals in a queue-scheduled observing format.

During the second half of the semester there will be no lectures but there will be two computer lab sessions per week at which the lecturers and tutors will be available to help students reduce and analyse their observations. During this time the students are expected to complete their projects by:

- reducing and analysing the data obtained at UCMJO;
- preparing and presenting a poster related to their project towards the end of the semester;
- preparing a written report summarising the observations, analysis and results for their observational project, due at the end of the semester.

Learning Outcomes

After completing this course students should be able to:

- understand and solve appropriate problems in the reduction and analysis of archive photometric and spectroscopic data,
- plan and execute an observational project using the facilities available at UCMJO, including:
    - identify a science question and identify what is needed to do to answer that science question,
    - plan observations to answer the scientific question and justify the observations,
    - make appropriate use of the UCMJO astronomical instrumentation and telescopes to obtain scientific data,
    - demonstrate understanding and application of data reduction software on the observations using appropriate programs,
    - demonstrate understanding and application of the analysis of the reduced data using appropriate programs and developing any further software tools that are required,
    - answer the science question and present the results.
- work and interact positively in small teams with each member having a specific responsibility,
- develop scientific communication skills and be able to demonstrate these in a poster presentation (including oral explanation of poster) and a written report.

Assessment

10% Photometry data reduction
10% Spectroscopy data reduction
20% Observing proposal
10% Field trip
20% Poster presentation
30% Written report

Timetable

Semester 2 - Term 3

There will be a total of 12 lectures, all during the first term of semester 2. *Check your personal timetables at https://mytimetable.canterbury.ac.nz/aplus/apstudent) for scheduling of lecture times and venues, as these may change*.

At the time of writing these were scheduled for:

- Mondays 11:00am-12:00pm, A8 Lecture Theatre; and
- Tuesdays 11:00am-12:00pm, A8 Lecture Theatre.

There will also be 6 computer labs/tutorials. During these, you will learn how to use some of the software required to accomplish your projects and there will also be time to discuss your observing project with the lecturers and tutors.

At the time of writing these are scheduled for:

- Wednesdays 3:00pm-6:00pm, Ernest Rutherford 212 Computer Lab.

Mid-semester break

Field trips to UCMJO will be organised between the 23rd August and 4th September. The class will be split into several groups, and each group will go in turn to UCMJO for approximately 4 nights each (tbc). The exact dates will be confirmed at the start of the semester.

Semester 2 - Term 4

During this term there will be no lectures but you will reduce and analyse your project data, and prepare and present your poster and written report. There will be two weekly computer labs for you to get help with the data reduction and analysis.

At the time of writing these are scheduled for:

- Mondays 4:00pm-6:00pm Ernest Rutherford 212 Computer Lab..
- Wednesdays 3:00pm-5:00pm, Ernest Rutherford 212 Computer Lab.

Timetable

Term 3					
Session	**Monday Date**	**Mon 11-12**	**Tues 11-12**	**Wed 3-6 Lab/Tutorial topic**	**Assessment due**
Week 1	14 Jul	L1	L2	Introduction to observing proposals	
2	21 Jul	L3	L4	Introduction to analysing data	
3	28 Jul	L5	L6	Introduction to data reduction	
4	4 Aug	L7	L8	Reducing photometric data	**Wed 6pm: Submit In-lab report and reduced data file**
5	11 Aug	L9	L10	Reducing spectroscopic data	**Wed 6pm: Submit In-lab report and reduced data file**
6	18 Aug	L11	L12	Time Allocation Committee	**Mon 5pm: Submit observing proposal.**

Lecture Break	**23 Aug to 4 Sep**	**Field trip to UC Mt John Observatory in small groups**

Term 4			
Session	**Monday Date**	**Mon 4-6, Wed 3-5 Lab/Tutorial topic**	**Assessment due**
7	8 Sep	Project work	
8	15 Sep	Project work	
9	22 Sep	Project work	
10	29 Sep	Project work	
11	6 Oct	Project work	**Poster: Friday 12pm**
12	13 Oct	Poster Presentation Project work	**Poster Presentation Session: Wed (time tbc)** **Written report: Sun 19th Oct 11:55 pm**

General Physics and Astronomy Information

Please consult the document General Course Information for Physics and Astronomy students here: https://apps.canterbury.ac.nz/1/science/phys-chem/PHYS%20-%20Course%20Outlines/General.PDF