



# ASTR7913

## Contemporary Research Techniques in Astrophysics

Session 2, In person-scheduled-weekday, North Ryde 2022

*School of Mathematical and Physical Sciences*

### Contents

---

|                                       |   |
|---------------------------------------|---|
| <u>General Information</u>            | 2 |
| <u>Learning Outcomes</u>              | 3 |
| <u>General Assessment Information</u> | 3 |
| <u>Assessment Tasks</u>               | 4 |
| <u>Delivery and Resources</u>         | 6 |
| <u>Unit Schedule</u>                  | 7 |
| <u>Policies and Procedures</u>        | 7 |
| <u>Changes from Previous Offering</u> | 9 |

---

#### **Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff

Convenor and project advisor

Matt Owers

[matt.owers@mq.edu.au](mailto:matt.owers@mq.edu.au)

7 Wally's Walk, rm 2.703

By email appointment.

Project advisor

Joanne Dawson

[joanne.dawson@mq.edu.au](mailto:joanne.dawson@mq.edu.au)

7 Wally's Walk

By email appointment.

Project advisor

Orsola De Marco

[orsola.demarco@mq.edu.au](mailto:orsola.demarco@mq.edu.au)

7 Wally's Walk, rm 2.706

By email appointment.

Project advisor

Devika Kamath

[devika.kamath@mq.edu.au](mailto:devika.kamath@mq.edu.au)

7 Wally's Walk

By email appointment.

Credit points

10

Prerequisites

Admission to MRes

Corequisites

Co-badged status

### Unit description

This unit will introduce students to fundamental analysis techniques used in contemporary astrophysics. Students will undertake a series of projects in which they will reproduce key recent results from research papers. The projects will span a range of potential topics from radio astronomy, instrumentation, high resolution optical spectroscopy of stars, spatially resolved spectroscopy of galaxies, quantitative structure of galaxies, analysis of large survey data, and computational theory. After completion of this unit, students will possess the skills required to undertake a range of advanced research projects.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** demonstrate the skills required to undertake research across a broad range of topics in astrophysics.

**ULO2:** apply advanced knowledge of fundamental analysis techniques used in astronomy research.

**ULO3:** critically evaluate scientific outcomes in light of applied analysis techniques.

**ULO4:** effectively communicate the results of astronomical research in written and oral form.

**ULO5:** independently solve complex computational and technical problems related to astronomy research projects.

## General Assessment Information

For each of the four projects, students will be required to submit a written report that describes the research problem addressed, the techniques used, as well as the outcomes and conclusions. Each report should be submitted by the due date and time. Students will also undergo an oral assessment for each project. Please note that the time listed against each assessment task is the estimated time required to complete the task *in addition to the time spent on the project itself*.

## Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see <https://students.mq.edu.au/study/assessment-exams/assessments> for more information.

Unless a Special Consideration request has been submitted and approved, a **5% penalty** (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the

assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](#).

## Assessments where Late Submissions will be accepted

In this unit, late submissions will accepted as follows:

- Project 1-4 – Yes, standard late penalties apply.

## Assessment Tasks

| Name                      | Weighting | Hurdle | Due                |
|---------------------------|-----------|--------|--------------------|
| <a href="#">Project 1</a> | 25%       | No     | Week 5             |
| <a href="#">Project 2</a> | 25%       | No     | Mid-semester break |
| <a href="#">Project 3</a> | 25%       | No     | Week 11            |
| <a href="#">Project 4</a> | 25%       | No     | Week 13            |

### Project 1

Assessment Type <sup>1</sup>: Project

Indicative Time on Task <sup>2</sup>: 12.5 hours

Due: **Week 5**

Weighting: **25%**

A report containing a written and oral component on the first of four projects undertaken during the unit.

On successful completion you will be able to:

- demonstrate the skills required to undertake research across a broad range of topics in astrophysics.
- apply advanced knowledge of fundamental analysis techniques used in astronomy research.
- critically evaluate scientific outcomes in light of applied analysis techniques.
- effectively communicate the results of astronomical research in written and oral form.

- independently solve complex computational and technical problems related to astronomy research projects.

## Project 2

Assessment Type <sup>1</sup>: Project

Indicative Time on Task <sup>2</sup>: 12.5 hours

Due: **Mid-semester break**

Weighting: **25%**

A report containing a written and oral component on the second of four projects undertaken during the unit.

On successful completion you will be able to:

- demonstrate the skills required to undertake research across a broad range of topics in astrophysics.
- apply advanced knowledge of fundamental analysis techniques used in astronomy research.
- critically evaluate scientific outcomes in light of applied analysis techniques.
- effectively communicate the results of astronomical research in written and oral form.
- independently solve complex computational and technical problems related to astronomy research projects.

## Project 3

Assessment Type <sup>1</sup>: Project

Indicative Time on Task <sup>2</sup>: 12.5 hours

Due: **Week 11**

Weighting: **25%**

A report containing a written and oral component of the third of four projects undertaken during the unit.

On successful completion you will be able to:

- demonstrate the skills required to undertake research across a broad range of topics in astrophysics.
- apply advanced knowledge of fundamental analysis techniques used in astronomy

research.

- critically evaluate scientific outcomes in light of applied analysis techniques.
- effectively communicate the results of astronomical research in written and oral form.
- independently solve complex computational and technical problems related to astronomy research projects.

## Project 4

Assessment Type <sup>1</sup>: Project

Indicative Time on Task <sup>2</sup>: 12.5 hours

Due: **Week 13**

Weighting: **25%**

A report containing a written and oral component on the fourth of four projects undertaken during the unit.

On successful completion you will be able to:

- demonstrate the skills required to undertake research across a broad range of topics in astrophysics.
- apply advanced knowledge of fundamental analysis techniques used in astronomy research.
- critically evaluate scientific outcomes in light of applied analysis techniques.
- effectively communicate the results of astronomical research in written and oral form.
- independently solve complex computational and technical problems related to astronomy research projects.

---

<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

Students will undertake four guided projects over the course of the semester, each coupled with an academic advisor. Students will be expected to spend **one full day per week** on their

projects, and will consult with the academic advisor in the weekly 2-hour workshops for help with problem solving. The first workshop in Week 1 will involve an introduction to the unit, and to the four projects and academics. The four projects will be computational in nature, so students will require access to either a laptop or desktop computer. There is no required text, and appropriate reading material will be made available by the academic advisors.

## Unit Schedule

Students will complete 4 mini-projects throughout the semester (N.B. the below ordering of the projects may change):

1. **Week 1:** Unit overview and introduction to the projects (2hr workshop)
2. **Weeks 2-4, Project 1:** Resolving the sources of gas ionisation in galaxies using optical spectroscopy. (Mentor: Matt)
3. **Weeks 5-7, Project 2:** Understanding stellar collisions using 3D hydrodynamic simulations. (Mentor: Orsola)
4. **Weeks 8-10, Project 3:** Kinematics of HII regions using radio interferometry. (Mentor: Jo)
5. **Week 11-13, Project 4:** Exoplanet detection using high-resolution spectroscopy. (Mentor: Devika)

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study



- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Changes from Previous Offering

Removed project presentation and added oral component for each project. Devika Kamath has come onboard, replacing Christian Schwab.