ASTR3020

Extragalactic Astronomy and Cosmology

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Mathematical and Physical Sciences

Contents

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General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
ASTR3010

Corequisites

Co-badged status

Unit description
Galaxies are vast collections of stars, gas and dust, gravitationally bound into an evolving and dynamic ecosystem of physical processes. The Milky Way Galaxy in which we live is just one of billions of galaxies in the observable Universe. This unit will look beyond our Milky Way, and examine how galaxies form and evolve over cosmic time, how we quantify and categorise their properties, and what they tell us about the Universe on the largest possible scales. Topics covered will include galaxy evolution, super-massive black holes, dark matter, dark energy, Big Bang cosmology, and gravitational waves. These topics will also be explored through practical sessions making use of public research data archives and contemporary analysis techniques.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Quality Education; Industry, Innovation and Infrastructure.

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 knowledge of quantitative and qualitative galaxy morphology from a

variety of observational evidence, and relate this to theories of galaxy formation and evolution.

ULO2: Explain the principal properties of stellar populations, including their evolution with time and metallicity, and how their properties are modelled.

ULO3: Calculate the dynamical properties of stellar systems based on analytic gravitational potentials, and use these to make inferences about galaxies.

ULO4: Explain the basic qualitative principles of, and observational evidence for, current cosmological models.

ULO5: Apply metrics in the context of cosmological models, and understand how observations constrain different components of these models.

ULO6: Demonstrate knowledge of current galaxy formation and evolutionary theories, and the techniques used to simulate these.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must achieve a total mark equal to or greater than 50%.

Late submission of written assessments:

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 will be provided to students who experience technical issues.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, portfolios/ assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration, **and notify the unit convenor to let them know a Special Consideration application has been lodged**.

Assessments where Late Submissions will be accepted

In this unit, late submissions of Portfolios will be accepted, with the Standard Late Penalty applied.

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, **please inform the convenor and submit a Special Consideration request through https://connect.mq.edu.au**.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Cosmology Portfolio	25%	No	11/09/2026	Individual	Yes	Open
Galaxies Portfolio	25%	No	06/11/2026	Individual	Yes	Open
Final Exam	50%	No	Exam Period	Individual	No	Observed

Cosmology Portfolio

Assessment Type [1]: Portfolio
Indicative Time on Task [2]: 22.5 hours
Due: **11/09/2026**
Weighting: **25%**
Groupwork/Individual: Individual
Short extension [3]: Yes
AI Approach: Open

This portfolio will include a combination of assigned problems and computer lab projects dealing with material from the second half of the unit (cosmology). The portfolio is designed to deepen students' understanding of the course content, and develop problem-solving skills.

On successful completion you will be able to:

- Explain the basic qualitative principles of, and observational evidence for, current cosmological models.
- Apply metrics in the context of cosmological models, and understand how observations constrain different components of these models.

Galaxies Portfolio

Assessment Type [1]: Portfolio
Indicative Time on Task [2]: 22.5 hours
Due: **06/11/2026**
Weighting: **25%**
Groupwork/Individual: Individual
Short extension [3]: Yes
AI Approach: Open

This portfolio will include a combination of assigned problems and computer lab projects dealing with material from the first half of the unit (galaxies). The portfolio is designed to deepen students' understanding of the course content, and develop problem-solving skills.

On successful completion you will be able to:

- Demonstrate knowledge of quantitative and qualitative galaxy morphology from a variety of observational evidence, and relate this to theories of galaxy formation and evolution.
- Explain the principal properties of stellar populations, including their evolution with time and metallicity, and how their properties are modelled.
- Calculate the dynamical properties of stellar systems based on analytic gravitational potentials, and use these to make inferences about galaxies.
- Demonstrate knowledge of current galaxy formation and evolutionary theories, and the techniques used to simulate these.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 30 hours
Due: **Exam Period**
Weighting: **50%**
Groupwork/Individual: Individual
Short extension [3]: No
AI Approach: Observed

You will undertake a final examination during the formal examination period.

On successful completion you will be able to:

- Demonstrate knowledge of quantitative and qualitative galaxy morphology from a variety of observational evidence, and relate this to theories of galaxy formation and evolution.
- Explain the principal properties of stellar populations, including their evolution with time and metallicity, and how their properties are modelled.
- Calculate the dynamical properties of stellar systems based on analytic gravitational potentials, and use these to make inferences about galaxies.
- Explain the basic qualitative principles of, and observational evidence for, current cosmological models.
- Apply metrics in the context of cosmological models, and understand how observations constrain different components of these models.
- Demonstrate knowledge of current galaxy formation and evolutionary theories, and the techniques used to simulate these.

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[1] 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

- Academic Success for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

Delivery and Resources

Lectures, Labs and SGTAs will be held in-person, on-campus.

Lectures and **SGTAs** begin in **Week 1**, while **Labs** will begin in **Week 2**.

Announcements regarding the unit will be made via the ASTR3020 iLearn Announcements Forum, which you will also receive as e-mails. You are expected to check your student e-mails regularly for any updates or additional information about the unit.

Questions of a general nature dealing with the unit -- for example about lectures, SGTAs, labs, assignments, etc. -- can be posted in the iLearn General Discussion Forum. If you have questions relating to your own personal circumstances, please e-mail the lecturers directly:

Daniel Zucker: daniel.zucker@mq.edu.au

Ángel López Sánchez: angel.lopez-sanchez@mq.edu.au

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (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). 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) 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 connect.mq.edu.au or if you are a Global MBA student contact 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/

Academic Success

Academic Success provides resources to develop your English language proficiency, academic writing, and communication skills.

- Ask a Study Coach
- 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 Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the Service Connect Portal, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit https://students.mq.edu.au/support/technology/service-desk.

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

The order of the subject material has been changed, in that Cosmology will be covered first, followed by Galaxies.

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. As such, no major change to the delivery of the unit is planned, however we will continue to strive to improve the level of support and the level of student engagement.

Unit information based on version 2026.04 of the Handbook