



ASTR707

Advanced Astrophysics

S2 Day 2017

Dept of Physics and Astronomy

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	3
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	5
<u>Policies and Procedures</u>	5
<u>Graduate Capabilities</u>	7
<u>Changes from Previous Offering</u>	9

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General Information

Unit convenor and teaching staff

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Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit covers the fundamental physics of celestial objects such as stars and galaxies. It starts with the physics of fluid dynamics and the interaction of matter with light; these concepts are then used to describe the interstellar medium, including star formation and the stellar feedback of energy and new elements. The unit concludes with a discussion of galactic formation and evolution from the standpoints of interstellar gas and stellar populations. Observations of real celestial objects are used throughout the unit as examples of the processes we need to explain. Throughout the unit strong emphasis is placed on the connection between observations and interpretation. The student will gain an understanding of how different types of observations (imaging, spectroscopy, multi-wavelength approaches, survey approaches) can allow us to gain insight into specific astrophysical situations and how these observations can be interpreted in the light of theory. The scientific method will be used and emphasised as the backbone of all research and its stages underlined during class and all the activities.

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:

Understand the role of gas in the lives of galaxies, with respect to observations and theory

Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.

Understand the basics of binary interactions

Understand stellar pulsations and role this plays in stellar evolution and mass loss

Understand the synthesis of elements in stars and their observed chemical abundances

Understand the role of accretion of gas onto stars, both in star formation and binary interactions.

Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Assignment Tasks During Term</u>	50%	No	Approx. weeks 3, 5, 7, 10, 12
<u>Final Exam</u>	50%	No	University Exam Period

Assignment Tasks During Term

Due: **Approx. weeks 3, 5, 7, 10, 12**

Weighting: **50%**

Five assessed problem sets will be given during the semester, each worth 10% of the final grade. Additional problem sets may be provided by the lecturer for the purpose of self-assessment. Tutorial sessions will be used to review problem sets, and students are expected to be able to demonstrate their solutions on the whiteboard in front of the class.

The assignments are an integral part of the unit and aid your understanding of the material. Extensions will only be considered if requested with valid reasons prior to the due date, and the penalty for late submission of the assignments is the subtraction of 5% of the final assignment grade for every day of delay. The assignment can not be turned in more than 1 week past the official due date.

On successful completion you will be able to:

- Understand the role of gas in the lives of galaxies, with respect to observations and theory
- Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.
- Understand the basics of binary interactions
- Understand stellar pulsations and role this plays in stellar evolution and mass loss
- Understand the synthesis of elements in stars and their observed chemical abundances
- Understand the role of accretion of gas onto stars, both in star formation and binary interactions.
- Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Final Exam

Due: **University Exam Period**

Weighting: **50%**

The final examination will be of three hours duration plus ten minutes reading time. Battery or solar powered calculators which do not have a full alphabet on the keyboard will be allowed into the examination. Calculators with text retrieval are not permitted for the final examination.

You are expected to present yourself for the final examination at the time and place designated in the University examination timetable (<http://www.timetables.mq.edu.au/>). The timetable will be available in draft form approximately eight weeks before the commencement of examinations and in final form approximately four weeks before the commencement of examinations.

The only exception to not sitting the examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to apply for Special Consideration (see 'Special Consideration' in this Guide). If a supplementary

examination is granted as a result of the special consideration process the examination will be scheduled after the conclusion of the official examination period. You are advised that it is the policy of the University not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, i.e. the final day of the examination period.

On successful completion you will be able to:

- Understand the role of gas in the lives of galaxies, with respect to observations and theory
- Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.
- Understand the basics of binary interactions
- Understand stellar pulsations and role this plays in stellar evolution and mass loss
- Understand the synthesis of elements in stars and their observed chemical abundances
- Understand the role of accretion of gas onto stars, both in star formation and binary interactions.

Delivery and Resources

The course will be delivered through weekly lectures and tutorial sessions. The unit will cover four parts:

- 1) Astrophysics of the Interstellar Medium (3 weeks, lecturer Joanne Dawson)
- 2) Astrophysics of star formation, including the effects of magnetic fields (3 weeks, lecturer Orsola De Marco)
- 3) Stellar Pulsations and Stellar Nucleosynthesis (5 weeks, lecturer Devika Kamath)
- 4) Astrophysics of accreting gas in star formation and binary interactions (2 weeks, lecturer Orsola De Marco)

Each part will be assessed via problem sets during the term, and will be approximately proportionally represented in the final exam.

Policies and Procedures

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

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, 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.

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit 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.

Graduate Capabilities

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Understand the role of gas in the lives of galaxies, with respect to observations and theory
- Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.
- Understand the basics of binary interactions
- Understand stellar pulsations and role this plays in stellar evolution and mass loss
- Understand the synthesis of elements in stars and their observed chemical abundances
- Understand the role of accretion of gas onto stars, both in star formation and binary interactions.
- Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Assessment tasks

- Assignment Tasks During Term
- Final Exam

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Understand the role of gas in the lives of galaxies, with respect to observations and theory
- Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.
- Understand the basics of binary interactions

- Understand stellar pulsations and role this plays in stellar evolution and mass loss
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- Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Assessment tasks

- Assignment Tasks During Term
- Final Exam

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Understand the role of gas in the lives of galaxies, with respect to observations and theory
- Understand the role of magnetic fields in the dynamics of interstellar gas and the role they play in star formation.
- Understand the basics of binary interactions
- Understand stellar pulsations and role this plays in stellar evolution and mass loss
- Understand the synthesis of elements in stars and their observed chemical abundances
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- Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Assessment tasks

- Assignment Tasks During Term
- Final Exam

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Solve problems in real-time during class tutorials, and demonstrate solutions to peers

Assessment task

- Assignment Tasks During Term

Changes from Previous Offering

In the previous offering, the unit contained the following sections:

- 1) Galaxies (2 weeks, lecturer Richard McDermid)
- 2) The Milky Way as a Galaxy (5.5 weeks, lecturer Daniel Zucker)
- 2) Astrophysics of the Interstellar Medium (5.5 weeks, lecturer Joanne Dawson)

In this current offering, the unit will contain the following sections:

- 1) Astrophysics of the Interstellar Medium (3 weeks, lecturer Joanne Dawson)
- 2) Astrophysics of star formation, including the effects of magnetic fields (3 weeks, lecturer Orsola De Marco)
- 3) Stellar Pulsations and Stellar Nucleosynthesis (5 weeks, lecturer Devika Kamath)
- 4) Astrophysics of accreting gas in star formation and binary interactions (2 weeks, lecturer Orsola De Marco)