



ASTR377

Astrophysics

S1 Day 2017

Dept of Physics and Astronomy

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Disclaimer

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General Information

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Lecturer

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Credit points

3

Prerequisites

MATH235 and PHYS201 and PHYS202

Corequisites

Co-badged status

Unit description

The first part of this unit covers the physical mechanisms responsible for the generation, absorption and scattering of light in environments as diverse as rarefied nebulae, hot compact stellar atmospheres and distant galaxies. During the second part of the unit the theory of stellar structure and evolution is developed. Students become familiar with the UNIX computing environment and the python programming language, and carry out a project using computer models of how stars are born and die.

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 principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we

receive from it.

Demonstrate understanding of the way radiation interacts with matter in different astrophysical environments through solving radiative transfer problems.

Be able to describe the internal structure of our Sun and stars other than the Sun, and explain the key observational properties of different types of stars.

Apply the equations of stellar structure and the simplifications that lead to polytropic stellar models.

Be able to explain the processes and physics involved in stellar evolution, including the processes that bring about stellar death.

Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

General Assessment Information

Hurdle tasks

This unit has hurdle requirements, specifying a minimum standard that must be attained in aspects of the unit. To pass this unit you must obtain marks of at least 40% in the final examination, 40% in the laboratory project, and (of course) an overall 50% in the unit.

Second-chance hurdle examinations will be offered in the week of July 24 - 28. Results will be released on July 13. You will be notified shortly after that date of your eligibility for a hurdle retry and you must also make yourself available during that week to take advantage of this opportunity.

Late Assessments Policy

The non-examination assessment components should be submitted via iLearn by the due date and time.

The penalty for late submission is deduction of 5% of the possible mark for that item for each 24 hour period (or part) overdue. Assessments will not be accepted for marking if submitted more than 1 week past the due date. Extensions to the due dates for assignments, practical assessments, and project will only be considered if requested with valid reason prior to the due date.

Students anticipating or experiencing difficulties in meeting a deadline should discuss this with one of the lecturers in the first instance, ideally ahead of the deadline, if at all possible.

Students should also be familiar with the University's Disruptions to Study policy (http://www.mq.edu.au/policy/docs/disruption_studies/policy.html).

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Assignments</u>	20%	No	Weeks 3, 6, 9, and 12
<u>Practical Assessments</u>	20%	No	Week 3, 5, 7, and 10
<u>Project</u>	20%	Yes	Week 13
<u>Final Examination</u>	40%	Yes	Session 1 exam period

Assignments

Due: **Weeks 3, 6, 9, and 12**

Weighting: **20%**

There will be 4 assignments, each worth 5% of the final grade. Two will be given in each half of the unit. The assignments will be based on the lecture material, and will be set at regular intervals. The assignments are an integral part of the unit and aid your understanding of the material. The total weight of the assignments on the final grade is 20%.

On successful completion you will be able to:

- Understand the principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
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- Be able to describe the internal structure of our Sun and stars other than the Sun, and explain the key observational properties of different types of stars.
- Apply the equations of stellar structure and the simplifications that lead to polytropic stellar models.
- Be able to explain the processes and physics involved in stellar evolution, including the processes that bring about stellar death.
- Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

Practical Assessments

Due: **Week 3, 5, 7, and 10**

Weighting: **20%**

The lab sessions will take the form of exercises using the python computing language to manipulate functions that represent physical systems considered during lectures. The lab work will reinforce concepts from the lectures, and demonstrate how computers can be used to test and explore physical models. Basic numerical techniques and data visualisation will be covered. There will be 4 equally-weighted assessment tasks: 3 in the first half of the unit, and 1 in the second half. Each task will be assigned two weeks of lab time. Python notebooks will be used to conduct the labs, and completed notebooks will be submitted and graded electronically. Each notebook will be due one week after its lab time is completed.

On successful completion you will be able to:

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- Apply the equations of stellar structure and the simplifications that lead to polytropic stellar models.
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Project

Due: **Week 13**

Weighting: **20%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

Students will undertake a practical project involving computer programming, astrophysical interpretation, report and presentation. Computational facilities will be available in the laboratory. The project will be undertaken during Weeks 10-13.

Satisfactory completion of the project is a hurdle requirement. You must obtain a project mark of at least 40% to pass the unit. If instead you receive a mark of 30-39%, you must within two weeks arrange a new deadline to submit a revised project.

On successful completion you will be able to:

- Understand the principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
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- Apply the equations of stellar structure and the simplifications that lead to polytropic stellar models.
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Final Examination

Due: **Session 1 exam period**

Weighting: **40%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

The final examination will be of three hours duration plus ten minutes reading time.

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.

The final examination is a hurdle requirement. You must obtain a mark of at least 40% to pass the unit. If your mark in the final examination is between 30% and 39% inclusive then you will be given a second and final chance to attain the required level of performance.

On successful completion you will be able to:

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interpret the physical characteristics of an astronomical object based on the light we receive from it.

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- Be able to describe the internal structure of our Sun and stars other than the Sun, and explain the key observational properties of different types of stars.
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- Be able to explain the processes and physics involved in stellar evolution, including the processes that bring about stellar death.

Delivery and Resources

Your lecturers are Professors Mark Wardle and Orsola De Marco. Delivery will be through lectures and lecture-tutorials (where content and problem solving examples are given).

Lab sessions will be conducted in the Physics and Astronomy computer lab, and will make use of Python Notebooks, running via the Anaconda python package. **Note that labs start in Week 1.**

Resources will be announced on iLearn. There is no required text, but the course will be closely based on material drawn from one of our favourite books: "An Introduction to Modern Astrophysics" by Carroll and Ostlie.

Unit Schedule

Lectures: Monday 12-2pm in W5A 204 and Friday 1-2pm in W6B 382.

Practicals (Computer laboratory): Friday 2-5pm in E7B 209.

Note: Lectures and Practical start in Week 1.

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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcome

- Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

Assessment task

- Project

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

Assessment tasks

- Practical Assessments
- Project

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Understand the principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
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- Be able to explain the processes and physics involved in stellar evolution, including the processes that bring about stellar death.
- Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

Assessment tasks

- Assignments
- Practical Assessments
- Project

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

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Assessment tasks

- Assignments
- Practical Assessments
- Project
- Final Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understand the principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
- Demonstrate understanding of the way radiation interacts with matter in different astrophysical environments through solving radiative transfer problems.
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computing language.

Assessment tasks

- Assignments
- Practical Assessments
- Project
- Final Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Understand the principles and difficulties of observational methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
- Demonstrate understanding of the way radiation interacts with matter in different astrophysical environments through solving radiative transfer problems.
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Assessment tasks

- Assignments
- Practical Assessments
- Project
- Final Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Be able to apply computational techniques to model physical phenomena in different astrophysical environments using the Unix environment and elements of the python computing language.

Assessment tasks

- Assignments
- Project
- Final Examination