ASTR377

Astrophysics I

S1 Day 2015

Dept of Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff Lecturer Orsola De Marco orsola.demarco@mq.edu.au Contact via orsola.demarco@mq.edu.au Unit Convenor Richard McDermid richard.mcdermid@mq.edu.au Contact via richard.mcdermid@mq.edu.au Orsola De Marco orsola.demarco@mq.edu.au
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 way radiation interacts with matter in different astrophysical

environments. Demonstrate this understanding through radiative transfer problem solving.
Knowledge of the methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
Knowledge of the structure of our Sun and stars other than the Sun. Apply the equations of stellar structure and the simplifications that allow polytropic stellar models.
Knowledge of the processes and physics involved in stellar evolution (change over time), including the processes that bring on stellar death.
Knowledge of computational environments and languages as well as techniques that allow us to model different astrophysical environments. This includes the Unix environment and elements of the python language.

Assessment Tasks

Name	Weighting	Due
Practical Assessments	20%	TBD
Assignments	20%	13 Mar, 24 Apr, 12 June
Project	10%	Friday 12 June, 4pm
Final Examination	50%	TBD

Practical Assessments

Due: **TBD**
Weighting: **20%**

Participation in the laboratory activity is required to comlete the unit. 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 physical models. Basic numerical techniques and data visualisation will be covered. The laboratory in week 1 will not be marked, but will contain essential practical information for future weeks. The remaining 8 weeks will cover 4 projects, each worth 5%.

On successful completion you will be able to:

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- Knowledge of the methods that allow us to interpret the physical characteristics of an

astronomical object based on the light we receive from it.

- Knowledge of the structure of our Sun and stars other than the Sun. Apply the equations of stellar structure and the simplifications that allow polytropic stellar models.
- Knowledge of the processes and physics involved in stellar evolution (change over time), including the processes that bring on stellar death.
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Assignments

Due: **13 Mar, 24 Apr, 12 June**
Weighting: **20%**

The first is an "early assessment assignment" and is meant to identify possible learning and teaching challenges. The following two assignments will be based on the lecture material 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% (the first, early diagnostic assignment is worth 4%; each of the following two, regular assignments is worth 8%). 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 grade for every day of delay. The assignment can not be turned in more than 1 week past the official due date.

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- Knowledge of the structure of our Sun and stars other than the Sun. Apply the equations of stellar structure and the simplifications that allow polytropic stellar models.
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Project

Due: **Friday 12 June, 4pm**

Weighting: **10%**

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. Extensions will only be considered if requested with valid reasons prior to the due date, and the penalty for late submission of the practical project is the subtraction of 5% of the final grade for every day of delay. For any problems with meeting the deadlines, please contact the Unit Convenor.

On successful completion you will be able to:

- Knowledge of the methods that allow us to interpret the physical characteristics of an astronomical object based on the light we receive from it.
- Knowledge of the structure of our Sun and stars other than the Sun. Apply the equations of stellar structure and the simplifications that allow polytropic stellar models.
- Knowledge of the processes and physics involved in stellar evolution (change over time), including the processes that bring on stellar death.
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Final Examination

Due: **TBD**
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.

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Delivery and Resources

Resources will be announced on iLearn. There is no required text, but the course will be closely based on material contained in one of our favourite books: "An Introduciton to Modern Stellar Astrophysics" (or the expanded "An Introduction to Modern Astrophysics") by Carroll and Ostlie. Your lecturers are Dr Richard McDermid and A/Prof Orsola de Marco.

Unit Schedule

Lectures: Monday 12pm until 2pm (W5C 301) and Wednesday 11am until 12pm (Y3A 210)

Practical (Computer laboratory): Wednesday 2pm until 5pm (E7B 209)

For Unit Schedule/Syllabus refer to iLearn

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.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use 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

- Knowledge of computational environments and languages as well as techniques that allow us to model different astrophysical environments. This includes the Unix environment and elements of the python 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:

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:

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allow us to model different astrophysical environments. This includes the Unix environment and elements of the python language.

Assessment tasks

- Practical Assessments
- Assignments
- 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:

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Assessment tasks

- Practical Assessments
- Assignments
- 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

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Assessment tasks

- Practical Assessments
- Assignments
- 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.

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Assessment tasks

- Practical Assessments
- Assignments
- 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:

Assessment tasks

- Assignments
- Project
- Final Examination