ASTR170

Introductory Astronomy: Our Place in the Universe

S1 Day 2014

Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
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Credit points
3

Prerequisites

Corequisites

Co-badged status

Unit description
This is a foundation unit in astronomy, suitable for aspiring physicists/astronomers and non-scientists alike. No prior knowledge of astronomy or physics is required. This unit gives a broad underpinning of basic astronomical subjects and concepts with minimal mathematical content. A diverse range of astronomical topics are covered, starting with the solar system, including comets and asteroids; and then increasing in scale to Galactic stars, nebulae, the interstellar medium, our own Milky Way galaxy, galaxy clusters, quasars, black holes and basic cosmology. Key fundamental physical principles, theories and observational technologies are covered. Experimental work is both hands-on and computer based, and covers such areas as galaxy classification, eclipses, spectroscopy and geometrical optics. A session at the Macquarie University Observatory forms a recommended part of the practical work.

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:

Have an understanding of the scale of the Universe and our relative place in it
Appreciate how the development of astronomy through history has altered our perceptions (world view) of our physical universe
Have an understanding how science advances though observation and incrementally for the most part via the scientific method with the occasional "paradigm shift"
Appreciate how our current knowledge is based on the development of enabling technology and especially through advances in the practical tools of modern astronomy: telescopes, imaging detectors and spectrographs
Have a basic understanding of the physics of light and gravity.
Obtain an understanding for how astronomical measurements are made and how they underpin everything we know: especially how we study objects we can't actually touch.
Have an understanding of the Motions of the Sun, Moon and planets in our solar system across the sky.
Understand how the earth's seasons arise and how eclipses of both Sun and moon occur.
Have a basic understanding of the the structure of the Sun and its family, the Solar System (planets, comets, asteroids etc).
Have a basic understanding of the panoply of Stars and their evolutionary lifecycle from birth, life and death and how this is controlled by their birth mass.
Appreciate the complexity of the material that exists between the stars: the interstellar medium and its extreme range of physical conditions (temperature and density).
Obtain a basic understanding of the structure and components of our galaxy, the Milky Way.
Acquire a basic understanding of the nature and diversity of other galaxies, including extreme examples such as quasars. Also obtain a basic appreciation of the large-scale structure of the Universe as described by the distribution of galaxies.
Have a basic understanding of modern Cosmology: how the Universe began and where it's going.
Obtain an appreciation of the factors that could affect life in the Universe.

Assessment Tasks

Name	Weighting	Due
Final Examination	60%	University Examination period
Assignments (6)	20%	Week 2-12

Name	Weighting	Due
Laboratory Work	20%	See lab timetable

Final Examination

Due: **University Examination period**
Weighting: **60%**

The Final Examination will be three hours in duration. The basic format will essentially follow that of previous years. Calculators which do not have a full alphabet on the keyboard will be allowed into the examination. You are expected to present yourself for examination at the time and place designated in the University Examination Timetable (http://www.timetables.mq.edu.au/exam/). The timetable will be available in draft form approximately eight weeks before the commencement of the examinations, and in final form approximately four weeks before the commencement of the examinations.

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Assignments (6)

Due: **Week 2-12**
Weighting: **20%**

There is a special assignment worth 10% and an observatory based assignment worth 2% within this overall 20%

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Laboratory Work

Due: **See lab timetable**
Weighting: **20%**

The laboratory exercises consist of a variety of experiments of varying complexity, designed to familiarise students with fundamental concepts (C-Pracs), such as astronomical optics and eclipses, and with a variety of astronomical phenomena (P-Pracs). Most experiments are based on hands-on equipment, but there are several computer-based exercises. There will also be optional evening observing sessions at the Macquarie University Observatory scheduled during the semester, for which students must sign up. Students must complete six practicals in the laboratory.

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- Understand how the earth's seasons arise and how eclipses of both Sun and moon occur.
- Appreciate the complexity of the material that exists between the stars: the interstellar medium and its extreme range of physical conditions (temperature and density).
- Obtain a basic understanding of the structure and components of our galaxy, the Milky

Way.

Delivery and Resources

Classes

Lecture 1: Tuesday 3pm E7B Mason Theatre

Lecture 2: Tuesday 4pm E7B Mason Theatre

Lecture 3: Thursday 1pm E7B Mason theatre

Laboratory work

Class size dictates 4 laboratory streams as below (each of size <72 students)

Stream 1: Thursday E7B 209-13 10:00am - 12:00pm

Stream 2: Thursday E7B 209-13 2:00pm - 4:00pm

Stream 3: Friday E7B 209-13 10:00am - 12:00pm

Stream 4: Friday E7B 209-13 2:00pm - 4:00pm

NB Laboratory work starts in week 4.

Required Unit Materials A Lab notebook needs to be purchased from the co-op bookshop ($20).

Required Text book Foundations of Astronomy, Michael A. Seeds (Author) and Dana Backman (Author), Published by Brooks/Cole, ISBN-13: 9780538733533, 12th edition. Also see web references under “Schedule of Topics”.

Unit Schedule

The unit is taught by Prof. Quentin A Parker & Dr. Lee Spitler and covers the following schedule of topics:

- Introduction
- Ancient Astronomy and the Development of Modern Astronomy
- Basic Optics
- Telescopes and other Detectors
- Basic Physics for Understanding Astronomy
- Astronomical Measurements
- Motions of the Sun, Moon and Planets

- The Solar System
- Stars and their Lifecycle
- Pulsars and Black Holes • Nebulae
- The Milky Way
- Galaxies
- Peculiar Galaxies and Quasars
- Cosmology and the large scale structure of the Universe
- Life in the Universe and Astrobiology

Note: The progress of the course is generally in the sense of increasing scale.

The order of the lectures is not set in stone and may vary slightly depending on possible observing commitments of the lecturers (who are active researchers) and other factors. However all the topics will be covered!

Web Resources (interesting sites to look at; you can find many more):

Some Astronomy Sites in Australia: Astronomy at Macquarie University http://www.physics.mq.edu.au/astronomy/ Australian Astronomical Observatory (AAO) Home Page http://www.aao.gov.au/aaohomepage.html The Australia Telescope National Facility (ATNF) Home Page http://wwwatnf.atnf.csiro.au/ Sydney Institute for Astronomy, University of Sydney http://www.physics.usyd.edu.au/sifa/ Astrophysics and Optics, University of New South Wales http://www.phys.unsw.edu.au/astro/ Mount Stromlo and Siding Springs Observatories, Australian National University http://msowww.anu.edu.au/ Astrophysics Group, University of Melbourne http://astro.physics.unimelb.edu.au/ Centre for Astrophysics and Supercomputing, Swinburne University http://astronomy.swin.edu.au/ International Centre for Radio Astronomy Research (ICRAR), University of Western Australia / Curtin University http://www.icrar.org/ Australian Square Kilometre Array Pathfinder (ASKAP) http://www.atnf.csiro.au/SKA/

A Sample of Astronomy Sites from Around the World: Hubble Space Telescope News and Images European Southern Observatory (ESO) NASA Astrophysics Home Page NASA Solar System Exploration Home Page European Space Agency Space Science National Optical Astronomy Observatory (NOAO) http://hubblesite.org/newscenter/ http://www.eso.org/public/ http://science.nasa.gov/astrophysics/ http://solarsystem.nasa.gov/index.cfm http://www.esa.int/esaSC/index.html http://www.noao.edu/

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/

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

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 outcomes

- Have an understanding of the scale of the Universe and our relative place in it
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Assessment tasks

- Final Examination
- Assignments (6)
- Laboratory Work

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.

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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.

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Assessment tasks

- Final Examination
- Assignments (6)
- Laboratory Work

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:

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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:

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Assessment tasks

- Final Examination
- Assignments (6)
- Laboratory Work

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 outcomes

- Appreciate how the development of astronomy through history has altered our perceptions (world view) of our physical universe
- Have a basic understanding of modern Cosmology: how the Universe began and where it's going.
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Assessment tasks

- Final Examination
- Assignments (6)
- Laboratory Work

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 outcomes

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Assessment tasks

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Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

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Assessment task

- Assignments (6)

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Appreciate how the development of astronomy through history has altered our perceptions (world view) of our physical universe
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Assessment tasks

- Assignments (6)
- Laboratory Work

What has changed

Timetale updated for 2014