

Liverpool John Moores University

Title: EXPLORING THE UNIVERSE
Status: Definitive
Code: **4016ASTRON** (117215)
Version Start Date: 01-08-2011

Owning School/Faculty: Astrophysics Research Institute
Teaching School/Faculty: Astrophysics Research Institute

| Team | Leader |
|---------------|--------|
| Andrew Newsam | Y |
| Ivan Baldry | |

Academic Level: FHEQ4 **Credit Value:** 24.00 **Total Delivered Hours:** 12.00
Total Learning Hours: 240 **Private Study:** 228

Delivery Options

Course typically offered: Runs Twice - S1 & S2

| Component | Contact Hours |
|-----------|---------------|
| Online | 12.000 |

Grading Basis: 40 %

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|----------|-------------------|---------------------------|---------------|---------------|
| Test | test | Multiple Choice Test | 25.0 | |
| Practice | comp prac | Computer Based Practicals | 31.0 | |
| Practice | tour | Tour of the Night Sky | 14.0 | |
| Practice | obs | Observational Project | 15.0 | |
| Essay | essay | Essay | 15.0 | |

Aims

This module is intended as a standalone distance learning course suitable for students from any background and as such requires no specialist mathematical or scientific skills. It is intended to be a self-contained multimedia astronomy course using interactive CD-ROM material, videos, photographic plate material, the world wide web and email. It will follow a syllabus that introduces a wide range of topics in

modern astronomy and astrophysics.

Learning Outcomes

After completing the module the student should be able to:

- LO1 Describe in broad terms the way our knowledge of the large-scale contents of the universe has developed from pre-history to the present day, and how this development has influenced, and benefited from the advance of science and technology in general.
- LO2 Demonstrate a familiarity with the overall geography of the heavens, an appreciation of the types of observatories that are used to gather astronomical information, and practical experience of observing.
- LO3 Be confident with astronomical computing and the use of an internet browser.
- LO4 Describe in broad terms our current state of knowledge of the large-scale contents of the Universe including how stars and galaxies evolve and how they fit into ideas about the Universe into its present and future state.
- LO5 Discuss the major questions that are currently being addressed in astronomy.
- LO6 Demonstrate experience of the acquisition, reduction and analysis of astronomical data, astronomical computing and use of the world wide web.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

| | | | | | |
|-----------------------------|---------|---------|---------|---------|--|
| test | LO 1 | | | | |
| computer based practical | LO 1 | LO 3 | LO 4 | LO 6 | |
| tour of night sky | LO 2 | | | | |
| observational project | LO 2 | LO 6 | | | |
| essay | LO 3 | LO 5 | | | |

Outline Syllabus

- 1) *Introduction to Astronomical Computing.*
- 2) *The Earth in space; seasons, tides, phases of the Moon; eclipses; monitoring and communications satellites; finding your way around the night sky; constellations; the scale of the universe.*
- 3) *The Sun; solar flares; sunspots; solar granulation; internal structure; composition; solar corona and wind; solar energy; solar neutrino problem.*
- 4) *The Solar system; inner 'rocky' planets; asteroids; outer gaseous planets; comets; formation and evolution; extrasolar planets; planetary exploration; planetary mining.*

- 5) *Stonehenge and megalithic astronomy; early civilisations' view of the Universe; astronomy versus astrology; Greek cosmological theory.*
- 6) *The birth of 'modern' astronomy. Copernicus and the subsequent revolution in thought; Galileo, Kepler and Newton; the astronomical and technological revolution.*
- 7) *Topical special - hot new issues in astronomy. Modern Observatories - underground, ground and space-based ... professional multi-wavelength astronomy; the electromagnetic spectrum; the Liverpool robotic telescope and the World-Wide Web.*
- 8) *Astrophotography - the colour of the Universe.*
- 9) *How a professional observatory operates; the Liverpool Telescope a case study.*
- 10) *Cycles of creation; formation of stars and planets; variable stars; galactic structures; interstellar medium; stellar energy sources; evolution of stars; dying stars.*
- 11) *Stellar remnants: brown dwarfs, white dwarfs, neutron stars & pulsars, black holes, supernovae; dark matter candidates.*
- 12) *Cosmology; why is the sky dark at night; the big bang and other cosmologies; thermal background radiation; the beginning of the Universe; formation of heavy elements.*
- 13) *Galaxy formation & evolution; galaxy classification; dynamics of galaxies; gravitational lensing; black holes; inflation; quasars; age of the Universe; missing mass; the fate of the Universe.*
- 14) *Search for extraterrestrial intelligence; how life might evolve on other worlds; prospects for interstellar travel; terraforming.*
- 15) *Astrophotography; standard and digital photography; use of fibre optics; future technologies; building and buying your own telescope; amateur astronomy; astronomy on your home computer.*
- 16) *Observational Project. Design your own observing project; acquire and data process your own images; joint amateur and professional observing projects.*

Learning Activities

CD-ROM notes, multiple choice questions and exercises; video of lectures on DVD; web; email; use of photographic material; observing the night sky.

References

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|------------------------|----------|
| Course Material | Book |
| Author | Freedman |
| Publishing Year | 2008 |
| Title | Universe |
| Subtitle | |
| Edition | |
| Publisher | Kaufmann |
| ISBN | |

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|------------------------|-------------------|
| Course Material | Journal / Article |
| Author | |

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|------------------------|--|
| Publishing Year | 2010 |
| Title | New Scientist, Astronomy Now, Sky at Night |
| Subtitle | |
| Edition | |
| Publisher | |
| ISBN | |

Notes

This module is to replace the two 12 credit modules, ASTAS1016 and ASTAS1017 (which previously made up the Exploring the Universe course) with one single 24 credit module.