Introduction

Syllabus

Aims: To introduce the constituent objects of the Universe and the physics which allows us to estimate their distances, sizes, masses and natures. The module will show how our knowledge of the Universe beyond Earth relies entirely upon the application and extrapolation of physics developed in the laboratory. This will develop an appreciation of the wide range of applicability of physical principles, while touching upon areas under active development. The module will help the development of problem solving skills.

Objectives: At the end of the module you should be able to:

- List the main constituents of the Universe and give a basic description of them
- Describe methods for measuring the distances of stars and galaxies and work out example computations.
- Work out the masses of stars and galaxies given information on size or angle & distance and speed.
- Understand how the surface temperature of stars can be measured and how one can deduce physical conditions of their interiors.

Syllabus:

Description of the main constituents of the Universe with typical sizes, masses and distances covering: the Solar System. Stars and star clusters. Angles, distances & sizes: angular size and the small-angle approximation; trigonometric parallax; simple telescopes; distance methods based upon the inverse square law of brightness.

Masses: the Doppler effect and the measurement of speed from spectra; the use of speeds and sizes to derive masses in the Solar System, binary stars, star clusters and galaxies.

Physical properties of stars: stellar temperatures; spectra and elemental compositions. Physical conditions within stars

Galaxies: normal & active; the Milky Way; galaxy interactions; galaxy clusters.

The Universe: Hubble's discovery of the expansion of the Universe; implication of a finite age; the Cosmic Microwave Background; the composition of the Universe.

Commitment: 15 Lectures + 5 problems classes

⇒ Physics students: these are your normal problems classes, and are assessed the usual way!

⇒ Maths students: there are examples classes Thursdays at 13:00 in P521A, contact Rachel Edwards (`phscav@warwick.ac.uk`) if you cannot attend these classes for time reasons. The examples are not assessed.

⇒ All others: The examples are not assessed, but please try to do the homeworks as practising now will save you time later when preparing for the exam.

Assessment: 1 hour examination

Contents

Textbooks

ZEILIK & GREGORY, 1998, *Introductory Astronomy & Astrophysics*, 4th ed., Thomson Learning, £ 45 , 600 pp.

Intermediate level, requires calculus, self contained, but sometimes chaotic order.
Official textbook of this module.

KUTNER, 2003, *Astronomy: A Physical Perspective*, Cambridge: Cambridge Univ. Press, £ 35, 580 pp.

Modern physics and calculus based textbook. Recommended.

CARROLL & OSTLIE, 1996, *Modern Astrophysics*, Reading: Addison-Wesley, £ 47 (softcover), 1400 pp.

Advanced level, calculus based, expects good physics background.
Recommended if you want to continue with “Stars” and/or “Galaxies”.

YOUNG & FREEDMAN, 2004, University Physics, 11th Edition, Pearson/Addison Wesley, £ 48, 1800 pp.

Important background reading for all 1st year physics modules.

Homework

There will be weekly homeworks:

- given out today, due back in problems classes (for the physics students only) as indicated on the individual homework sheets.
- Maths students: examples classes are Thursdays, 13:00, P521A (non-assessed)
- there is one problem you are required to solve, plus two others, which you should at least try to attack.
- example solutions for assessed questions will be available from undergraduate office after the module is over, will be posted on WWW for the other questions.

Exam paper:

- Example exam questions are available on the WWW
- Looking at the homework *will* help you!

Class Notes

- Viewgraphs and additional material are available *after* each lecture via

  `http://www2.warwick.ac.uk/go/px144`

  for online viewing and download (PDF-Format).

- Discussions on module and the homework (but not solution posting!) are encouraged at the module forum, reachable via the above link.

And finally. . .

Please complain and ask questions if you think you haven't understood something.