Course Outline

1 Some useful information

Lecturer
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Course Webpage:
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2 What is High Energy Astrophysics?

High energy astrophysics (HEA) is the study of those astrophysical phenomena that involve particles of “high energy”. Frequently this refers to photons so that X-ray and gamma-ray astronomy are considered parts of high energy astrophysics, for example.

However, high energy, relativistic electrons are also responsible for low energy emission in the form of radio waves and parts of radio astronomy are therefore also considered to be part of HEA, etc. This is a personal but defensible definition.

HEA had its origins in the study of cosmic rays and then studies of the energetic component of the interstellar medium of the Galaxy. Now the range of subject matter is very broad and includes supernova remnants, the hot atmospheres of elliptical

galaxies, radio galaxies, quasars, jets in active galactic nuclei, black holes and gamma-ray bursters. We shall study various aspects of these phenomena using as a diagnostic base the theory of emission processes such as blackbody emission, synchrotron emission, inverse Compton emission and thermal Comptonisation. The emphasis is on a study of the objects, rather than a study of the details of the emission processes. However, comprehensive notes will be provided on the latter. This course complements Mike Dopita's course on the Interstellar Medium, which primarily involves a study of line emission processes in thermal; this course concentrates on continuum processes in nonthermal plasma.

3 Course philosophy & administration

- Lectures will not be detailed. Some material will only be sketched. However, the notes contain a lot of detail and you will find that they are quite self-contained.
- Lectures on the web page will have a posting date attached so that you can see whether the lecture has been revised.
- The emphasis in this course is on doing problems. You may need to consult the notes for material that is not covered in detail in lectures.
- Tutorials are very important in view of the problem oriented nature of this course.
- All lecture notes and the problem set will be available via my web page.
- Solutions will be posted when all assignments have been handed in.

4 Prerequisites and assumed knowledge

- A course in electrodynamics at 3rd or 4th year level
- Special relativity at 3rd or 4th year level (some acquaintance with the concepts of general relativity would be useful).
- A basic acquaintance with fluid dynamics

5 Assessment

Assessment is based entirely on the marks obtained for the assignments. In order to facilitate feedback I will ask you to hand in about 3-4 questions each week. I will endeavour to hand the marked questions back during the following week.

6 Schedule of lectures, tutorials and assignments

Times

Tuesday Lecture 11 am – 12 pm PSYCH G8
Wednesday: Lecture 12 pm – 1 pm PSYCH G8
Friday: Tutorial 11 am – 12 pm BOZO B17

This section of the course will go for about 6 weeks.