



**The Exeter College Summer Programme  
at Exeter College in the University of Oxford**

**Introduction to Astrophysics**

**Course Outline**

This is an introductory guide to our knowledge of the Universe, from the Solar System out to the most distant galaxies, and from the present day back to the earliest times. We will ask physical questions and make quantitative investigations, but with a simple level of mathematics so that the spotlight is always on the basic physics concepts.

The only prerequisite is introductory general physics, including calculus to the level of differentiation of simple functions.

**Teaching Methods and Assessment**

12 x 1.25hr Lectures (15hrs)

6 x 1.25hr Seminar Problem Classes (7.5hrs)

4 x 1.25hr Tutorials (5hrs)

**Performance Evaluation**

Final examination: 60%

Problem sheets: 30%

Participation and attendance: 10%

**Core reading**

The main textbook for the course is Carroll and Ostlie, *An Introduction to Modern Astrophysics*, Cambridge University Press (ISBN-13: 978-1108422161). Chapter numbers for the reading required for each lecture are given in the Lecture Schedule.

**Lecture Schedule**

**1 Introduction**

Length and time scales in the Universe. Observational methods. (CO 1,2,6)

**2 The Sun & the Solar System**

The Sun as a star; terrestrial, giant and minor planets (CO 11; 19-22)

**3 Properties of Stars**

Binaries, star clusters, colour-luminosity relations, HR diagram (CO 7, 8)

**4 Stellar Structure & Evolution**

Equations of stellar structure, nuclear reactions, stellar life cycles (CO 9,10,13-15)

**5 Planet Formation & Exoplanets**

Characteristics of extrasolar planetary systems, formation and evolution (CO 23)

- 6 The Milky Way**  
Morphology and kinematics; interstellar medium, gas and dust. *(CO 12,24)*
- 7 Galaxies I**  
Extragalactic distance scale Hubble's Law; tuning fork classification, galaxies in the local universe *(CO 25,27)*
- 8 Galaxies II**  
Formation and evolution of galaxies on Cosmic timescales *(CO 26)*
- 9 High-Energy Astrophysics I**  
Black holes, neutron stars; stellar remnants; supernova remnants and gamma-ray bursts *(CO 15,16)*
- 10 High-Energy Astrophysics II**  
Active galaxies; quasars and radio galaxies; accretion and relativistic jets. *(CO 28)*
- 11 Particle Astrophysics**  
Neutrinos, very-high-energy gamma rays, gravitational waves.
- 12 Cosmology**  
The very early universe; dark matter, dark energy. *(CO 29, 30)*