1. Introductory Lecture

Images: earth, sun, moon, lunar eclipse, Jupiter/Io/Europa, star field, star clusters, Orion nebula, Milky Way, optical/IR Milky Way, Andromeda nebula, galaxies, galaxy and dark matter halo, galaxy cluster, first Hubble diagram, 100" telescope, SDSS telescope and camera, Hubble Space Telescope, Holmdel telescope, SDSS sky map, SDSS galaxy redshift map, N-body simulation, supernova mosaic, Hubble Ultra Deep Field, COBE CMB map, WMAP CMB map, An End to Modernity, The Last Scattering Surface, Island Universe.

Some questions about the universe

How old is it? Has it been here forever? Will it go on forever?

How did the universe begin?

How big is the universe? Does it go on forever? Does it have an edge? What is its "shape"?

What does the universe contain?

Where do atoms come from? Where do planets, stars, and galaxies come from?

Themes of the course

1st half of course: The Big Bang theory. Mostly 1900-1970.
2nd half of course: Contemporary cosmology. Mostly 1980 - present.

Three elements of physics will be especially important to us: properties of light, gravity, nature of atoms.

Measuring distances and velocities, expansion of the universe.
Gravity and its influence on expansion.
The Big Bang theory.
The cosmic microwave background.
The origin of atoms.
Mapping the universe.
Dark matter.
Formation of galaxies and large scale structure.
Inflation and the very early universe.
Dark energy and the fate of the universe.

The shape and size of the earth

Before the 1500s, what arguments might you give for a spherical earth?

How could you measure the circumference of the earth?
(See the "Eratosthenes" link on the course web page.)