About this course

This course does not use math (more later).

If you would like a course with high-school math, consider the alternative course sequence: ASTR 2010, 2020

Make sure you have a copy of the course syllabus.

The syllabus answers many questions that may arise throughout the semester. Keep it and read it carefully!

Today

1. Discussion of syllabus; announcements

2. Introduction to astronomy; scale of the universe
Special lecture for extra credit
Colonel Jack R. Lousma, USMC, Ret., former Marine Corps pilot and NASA astronaut

Thursday January 14, 2010, 7:00 PM, Doerrmann Theater in University Hall

Free and open to the public

”The whole ’Good Earth’ in one small visor”

For extra credit: turn in a one-page report/journal/evaluation in class on Wednesday, Jan. 20
About the Observing Requirement

The first dates for ASTR 1010 observing at Brooks Observatory are:

Mon., January 25 – Thurs., Jan. 28: 7:00 – 8:15 PM

Brooks Observatory is on the 6th floor of this building. From the lobby outside this room, take the elevator to the 5th floor and walk up to the 6th.

All observing is weather permitting. For weather information see, after 5 PM each day:
http://astro1.panet.utoledo.edu/~ndm/1010s10.html

Additional dates each month this semester
One-page report/journal evaluation due Wed., Feb. 3
About the Planetarium Requirement

This Wednesday, Jan. 13, class will be held in Ritter Planetarium.
In addition, you will be required to attend a regular public planetarium show during the months designated on your ticket on either:

- Friday evening at 7:30 PM or
- Saturday afternoon at 1 PM (programming designed for children of all ages)

To avoid paying the admission charge, present your red ticket with the name of your instructor (Nancy Morrison) and your name written on it.

Tickets will be distributed in class later. There will also be a blue ticket for the observing session.
What is Astronomy?

1. Study of the sky as we see it

2. Study of nature of Sun, planets, stars, etc., by analysis of light received

“Nature” means things like

- Distance from us
- Motions
- Size
- Temperature
- Chemical composition ... etc.
What astronomy is not: *astrology*, a system that claims to predict events, personalities, based on positions of Sun, Moon, planets

Do not confuse them!
Subject matter of course

Knowing the sky
  • Orientation in the sky
  • Gravitation and orbits of planets and satellites
  • Cyclical changes and their causes

Astronomical tools: nature of light; the spectrum

Layout & origin of solar system

Nature of planets

Stars

Galaxies and the universe
Educational goals of course

Mastery of basic vocabulary of astronomy

Mastery of basic physical principles with some ability to apply them qualitatively

Mastery of basic, current information about the solar system, stars, galaxies, and the universe

Obtain basic understanding of how this information is obtained
Use of mathematics

Essentially none.

Logical reasoning, however, is very important in this course.

In general (with a few exceptions), you will not be responsible for numbers.

- Numbers will often be used in lecture for illustration.
- Do not memorize them.
- However, you will be required to know what is larger (older, etc.) or much larger than what else.
Distances and sizes in the universe

Units: scientists use metric, but I’ll use everyday units for illustration

Closest, most familiar objects

Smallest bodies: planets

- **Earth** radius 3,800 miles
- Earth-Moon distance 230,000 miles
- Earth-Sun distance 93 million miles = 1 *astronomical unit* (AU)
Scale model with the Earth a tennis ball: Moon would be a large marble more than 6 feet away.

Earth

Moon

(size is to scale)

230,000 miles
Diameter of solar system 80 AU (radius of Pluto’s orbit: 40 AU)

Distance to nearest neighbor star: 275,000 AU

If the Sun were the size of tennis ball, the Earth would be 23 feet away and the nearest neighbor star almost in Denver.

North America-scale "model" of the solar system

In this "model," the Earth is 36 miles from the Sun. If it could be shown in the model, the nearest star would be 9.9 million miles away - about 40 times farther than the Moon actually is and about 1/10 the actual distance to the Sun.

Link to the complete poster
Need a new unit of distance. Think of light travel time at 186,000 miles per second

- Earth–Moon: a bit more than 1 second
- Earth–Sun: 8 minutes
- Nearest neighbor star: 4 years
- Define a light year to be the distance light travels in 1 year
- Then nearest star is 4 light years away

The Galaxy: diameter approx 100,000 light years
Galaxies

• Thousands of them are close enough to study in some detail
• Millions if most distant ones are included
• Distances: millions up to billions of light years

Groups & clusters of galaxies

Superclusters—clusters of clusters

The universe: everything we can get information about by means of light
Review major items: don’t confuse them

- Planet Earth
- The solar system
- The Galaxy
- The universe
How to write your address in the cosmos

Your house number and street
Your city, state, and Zip Code
Your country
Planet Earth
The solar system
The Galaxy
The Local Group
The Local Supercluster
(The universe)

Video: *Powers of Ten*
Planet Facts:

Neptune’s blue color is caused by methane.

Neptune’s Great Dark Spot is an Earth-sized storm. NASA’s Voyager 2 spacecraft measured a wind speed of 1,105 miles per hour. These are the strongest recorded winds in the solar system.

Temperature on Neptune runs about -328°F. It is possible for humans to live there.

Neptune is surrounded by a very thin dark ring.

Neptune has three main moons: Triton, Despina, and Proteus.

Photos courtesy of NASA