

Introduction to Astronomy PHYS 162 - FL 2017 - Sect 1 ONLINE Course

College Online Astronomy Course

Under Construction. Below is how the non-online (that is normal course) was taught in Spring 2017. The Online course will cover the same material but with a different set of assignments.

Provides general education credit (Origins and Influences Pathway).

SUGGESTED BOOK

I am recommending but not requiring *Discovering the Essential Universe* by Comins editions 4, 5 or 6. We will discuss in the first lecture. You can also use a different textbook in particular *The Cosmic Perspective Fundamentals* by Bennett, Donahue, Scheider and Voit.

This course covers the science of the stars and other heavenly bodies. We use our knowledge of physics, chemistry, and geology to understand planets, stars, galaxies, and the Universe itself. Planets and stars also serve as laboratories for conditions beyond human-built experiments and studying them increases understanding of sciences. Early studies of planetary motion lead to understanding of gravity and forces (physics and so in this course). Modern studies of planets concern geology and weather (and are not in this course). Studies of stars, the formation of galaxies and the universe depend on the properties of basic matter and forces (physics and so in this course). The details of the course are contained in the syllabus below.

- [Syllabus](#)
- [Example Test 1](#)
- [Example Test 2](#)
- [Example Test 3](#)

The NIU [Observatory](#) is managed by Gregory Alley (e-mail gregory.alley@niu.edu).

- [August 2017 eclipse path in southern Illinois](#)
- [Paths of recent total eclipses](#)
- [Venus and Mercury in early 2017](#)
- [Venus in evening sky in early 2017](#)
- [Mars in 2015 and 2016](#)
- [Jupiter in 2014-2018](#)
- [Saturn in 2014-2022](#)
- [Graph Paper](#) for use in activities
- [Current Night Sky](#)
- For Winter 2017, Venus and Mars are evening planets while Jupiter, Saturn, and Mercury are morning planets.
- [Stellarium: free "planetarium" software](#)

Transparencies from Lectures

- [Lecture 1: Class overview, early observations \(Moon, eclipses, year\) 1/17/17](#)

[1999 Turkey Eclipse](#)

- Lecture 2: Star Location, Constellations and Intro to Solar System 1/19/17
- Lecture 3: Finish Star locations, Introduction to Planetary Motion + Models of the Solar System + Kepler 1/24/17

Solar System Motion

- Lecture 4: Models of the Solar System, Brahe + Kepler. MOVIE "Cosmic Voyage" 1/26/17

◦ **Orbit of Mercury Example**

- Lecture 5: Galileo, Newton and Gravity 1/31

Fake news story on Galileo

- Lecture 6: Finish gravity plus Light and Electromagnetic Force 2/6

Center of mass examples

- Lecture 7: Light Demo, Absorption, Greenhouse Effect 2/7

Water Vibrational Modes

Long timescale Temperature of Earth

Solar Energy:Consumer Reports

Accounting Firms and climate change

Coal-CEO-funded group pushes Texas textbook changes

Richard Alley (G. Alley's uncle) testifies on climate change

- Lecture 8: Doppler Effect, Telescopes 2/9

Mauna Kea Summit 3:40 inside

Hotel Mauna Kea (parody) start and LN:1:00-1:40 problems:3:30

30 m Telescope in Hawaii

Sloan Digital Sky Survey

SDSS publication with NIU students co-author

Dark Energy Survey

Dark Energy Survey press room

Arecibo 1000 ft = 305 m radio telescope from movie Contact

VLA radio telescope array (in movie Contact)

- Lecture 9: The Sun: Introduction and Nuclear Reactions 2/14

animation Fusion in the Sun

Movie 2012 - Neutrinos from the Sun

- Lecture 10: Layers of the Sun Test 1 study guide. Introduction to Stars 2/16

NASA video - a solar flare

Solar Storm January 2012

NASA video - more on solar flares/HESSI

- Lecture 11: Stars' Properties 2/21

Algol System - wikipedia

Center of mass examples

Class 12 - Test 1 - 2/23

- Lecture 13: Classifying Stars and Hertzsprung-Russell Diagram 2/28

- **Activity 1 Activity 1: Orion over time (file also has another activity we won't do)**

- Lecture 14: Nebula + Star Formation 3/2

Video - Star Formation and Evolution

Video - Nebula and Star birth

- Lecture 15 Star Evolution - Red Giants and White Dwarves 3/7

Video - Sun --> Red Giant, planetary nebula, white dwarf

- Lecture 16 Star Evolution - White Dwarves and Supernovas 3/9 plus Movie - NOVA - Death of a Star

Video - Type Ia supernova explosion simulation

- Spring Break March 13-17

- Lecture 17: Supernovas and Element Formation 3/21 **In-class worksheet on HR diagram**

If Betelgeuse goes Supernova

If Betelgeuse goes Supernova 7 minute version

Video - SN1987a over time

- **Class 18 meets on Wednesday 3/22 in Davis Hall Observatory at 7:00 PM. No Class on Thursday 3/23**

- Class 19: Neutron Stars and Black Holes 3/28
- Test 2 Overview.

Video - neutron stars and pulsars

The sound of Pulsars

Video - binary pulsars

binary pulsars and general relativity

Video - black hole interacting with star

Video - Life cycle of stars

- Lecture 20: Formation of Planets, Exoplanets 3/30

Alpha Centauri exoplanet

Cool star could host habitable planet

Kepler planet hunter site

- Lecture 21: Planetary Atmospheres, Life in the Universe 4/4

Goldilocks planet - trailer for movie Battleship

asteroid passing by Earth and meteor in Russia 2/15/2013

asteroid defense 2017 Physics Today article

NASA - faster than light drives

NASA - faster than light drives

Class 22 - Test 2 - 4/6

- Class 23: Communicating with ET 4/11 Movie:NOVA:Origins Where are the Aliens?
- Lecture 24: Galaxies - Intro, Measuring Distances, Hubble Law 4/13

Video - Andromeda Galaxy

Video - Andromeda and Milky Way Colliding Galaxies

- Lecture 25: Galaxies - Mass and Formation. may begin turning in extra credit 4/18
- In class worksheet on Hubble Law

New map of Milky Way Galaxy

Video - Galaxy Formation

M31(Andromeda) - M33(smaller spiral) Galaxy Interactions video

- Lecture 26: Cosmology and Early Universe Universe 4/20

Olber's Paradox

video - Why is the sky dark at night?

- o Lecture 27: More on Early Universe. Test 3 overview 4/25
- o Lecture 28: Extra Dimensions and Multiverse (not on test) 4/27

video - What is the Universe expanding into?

- o NOT YET UPDATED for this term

Class 29 - Test 3 - 5/2

- o Class 30 - Movie: Through the Wormhole: Beyond the Darkness - 5/4 Will have grades prior to taking the final

Final - Tuesday 5/9/2017 10:00-10:50

from fall semesters -- ignore for spring

- Monday 9/5 No Class Labor Day
- **Volunteer for STEMfest (held on October 8)**