

Introduction to Astronomy PHYS 162H - HONORS - Fall 2018

UNDER CONSTRUCTION

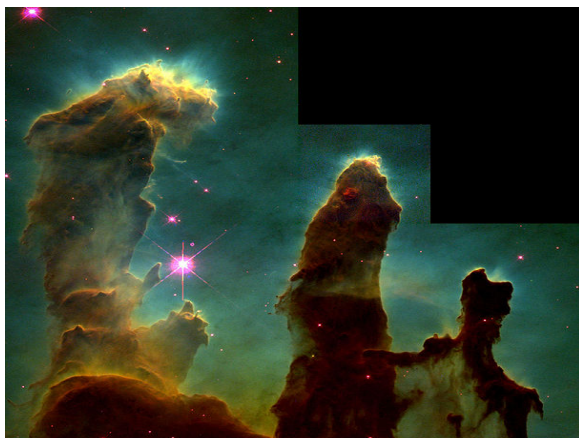
Davis Hall Rm 116 Mon-Wed-Fri 2:00-2:50

Provides general education credit (Origins and Influences Pathway). [David Hedin](mailto:David.Hedin@niu.edu) hedin@niu.edu [course poster](#)



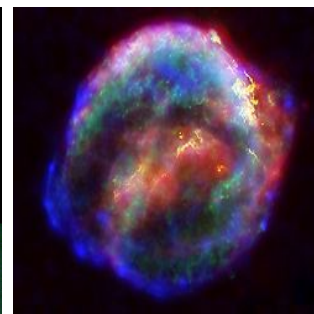
Hubble Deep Space View

This is a standalone honors section which also provides general education credit. The course is an introduction to astronomical science extending from historical astronomy through the most recent discoveries of astrophysics including stellar evolution, supernovas, white dwarves, neutron stars, black holes, dark matter and energy, and the Big Bang. The course will also cover techniques used by astronomers and some of the latest conjectures including the possibility of extra dimensions or multiple universes.



Stellar Birth (Eagle Nebula)

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.



Stellar Death (Remnant from the 1604 Supernova)

The honors section will have two lectures per week plus one "recitation" section each week. Each student will also complete a project, with examples given in the link below.

- [Syllabus](#)
- HONORS PROJECTS are [overviewed here](#) while details of what individual projects could be are [HERE](#).
- The NIU [Observatory](#) is managed by Christopher Marshall
- For Fall 2018, Venus, Jupiter, Saturn and Mars are evening planets in September with Mars the last to set at about 2:00 AM. In mid-November Mars is observable in the evening and Venus just before dawn. observable most of the night with Mars rising at about 10:00 PM. Mercury and Jupiter are observable in the early evening just after sunset for October and November.
- RECOMMENDED BOOK: I am recommending but not requiring Discovering the Essential Universe by Comins editions 4 or 5 or 6. You can also use a different textbook such as The Cosmic Perspective Fundamentals by Bennett, Donahue, Scheider and Voit.
 - [Example Test 1](#)
 - [Example Test 2](#)
 - [Example Test 3](#)
 - [Venus in 2016](#)
 - [Mars in 2015 and 2016](#)
 - [Jupiter in 2014-2018](#)
 - [Saturn in 2014-2022](#)
 - [August 2017 Illinois eclipse path](#)
 - [Paths of recent total eclipses](#)
 - [Graph Paper for use in activities](#)
 - [Current Night Sky](#)
 - [Stellarium: free "planetarium" software](#)
 - [How to use Stellarium](#)

o [Volunteer for STEMfest \(held on October 27\)](#)

Lectures and Activities Part I

- o [Lecture 1: Class overview, early observations 8/27/2018](#)
- o [1999 Turkey Eclipse](#)
- o [Lecture 2: Star Location and Constellations 8/29](#)
- o [Lecture 7: Absorption, Greenhouse Effect 9/19](#)
- o [Water Vibrational Modes](#)
- o [Long timescale Temperature of Earth](#)
- o [Solar Energy: Consumer Reports](#)
- o [Accounting Firms and climate change](#)
- o [Impact on using solar energy due to 2018 Tariff on solar panels](#)
- o [US Renewable Energy 2018](#)
- o [April 2018 Smithsonian Magazine: renewable energy in Texas](#)
- o [Environmental impact of living near fossil fuel plants](#)

Class 3: Overview of Projects and Observatory Tour 8/31

Activity 0.5 Project Status due 9/28

- o Monday 9/3 no class Labor Day
- o [Lecture 3: Introduction to Planetary Motion, Brahe and Kepler 9/5](#)

Class 5: Activity 1 Planets (uses Stellarium) 9/7

- o [Lecture 4: Kepler's Laws and Galileo 9/10](#)
- o [asteroid orbiting Earth](#)
- o [Parker Solar probe orbit about Sun \(and Earth, Venus, Mercury\)](#)
- o [Lecture 5: Galileo, Newton and Gravity 9/12](#)
- o [Fake news story on Galileo](#)
- o [Center of mass examples](#)

Class 8: MOVIE "Cosmic Voyage" 9/14.

- o [Lecture 6: Light and Electromagnetic Force 9/17](#)

Class 11: Activity 2 Motion of Stars (uses Stellarium) 9/11

- o [Lecture 8: Telescopes 9/24](#)
- o [Mauna Kea Summit 3:40 inside](#)
- o [Hotel Mauna Kea \(parody\) start and LN:1:00-1:40 problems:3:30](#)
- o [30 m Telescope in Hawaii](#)
- o [Arecibo 1000 ft = 305 m radio telescope from movie Contact](#)
- o [VLA radio telescope array \(in movie Contact\)](#)
- o [Dark Energy Survey](#)
- o [James Webb Telescope \(wikipedia\)](#)
- o [Lecture 9: Intro to Sun and Nuclear Reactions 9/26](#)
- o [Movie 2012 - Neutrinos from the Sun](#)
- o [India-based Neutrino Observatory](#)

Class 14: Activity 3 Atomic Spectra + Light Demo 9/28

- o [Lecture 10: Layers of the Sun Test 1 Study Guide 10/1](#)
- o [NASA video - a solar flare](#)
- o [Solar Storm January 2012](#)

Lectures Part II

- o [Lecture 11: Properties of stars 10/3](#)
- o [Algol System - wikipedia](#)
- o [Gaia satellite](#)

Class 17 - Test 1 - 10/5

Class 20: Movie SN 1987A 10/19

Activity 5.5 Project Status due 10/26

- [Lecture 12: Surface Temperature and Hertzsprung-Russell Diagram 10/8](#)
- [Lecture 13: Nebula and Stellar Birth and Evolution 10/10](#)
- [Video - Star Formation](#)
- [Video - Nebula and Star birth](#)
- [Lecture 16: Neutron Stars 10/22](#)
- [Video - neutron stars and pulsars](#)
- [The sound of Pulsars](#)
- [Video - binary pulsars](#)
- [binary pulsars and general relativity.](#)
- [Lecture 17 Black Holes 10/24](#)
- [Video - black hole interacting with star](#)

Class 17: [Activity 4](#) Parallax and Magnitude/Luminosity 10/12

- [Lecture 14 Stellar Evolution Red Giants, White Dwarves 10/15](#)
- [Video - Sun --> Red Giant, planetary nebula, white dwarf](#)
- [Lecture 15: White Dwarves and Supernovas 10/17](#)
- [If Betelgeuse goes Supernova 7 minute version](#)
- [Video - Type Ia supernova explosion simulation](#)
- [Video - colliding white dwarves](#)
- [colliding white dwarves](#)
- [Video - Type II blue supergiant supernova](#)
- [Video - SN1987a over time](#)

Lecture Part III

- [Lecture 19: Formation of Planets and Planetary Atmospheres 10/31](#)

Class 29: Test 2 11/2

- [Lecture 20: Exoplanets 11/5](#)
- [List of confirmed Kepler exoplanets](#)
- [Kepler planet hunter site](#)
- [Alpha Centauri exoplanet](#)
- [TESS satellite](#)
- [Lecture 21: Life in the Universe 11/7](#)
- [Goldilock's planet - trailer for movie Battleship](#)
- [asteroid passing by Earth November 2011](#)

Class 32: [Activity 6](#) Deep space objects (uses Stellarium) and Life in the Universe 11/9

- [Lecture 22: Introduction to Galaxies, Hubble Law 11/12](#)
- [Video - Andromeda Galaxy](#)

Class 26: [Activity 5](#) Hertzsprung-Russell Diagram (uses Stellarium) 10/26

- [Lecture 18: Formation of Elements - Test 2 overview 10/29](#)
- [Video - Life cycle of stars](#)

Class 35: [Activity 7](#) Hubble Law 11/16

- [Lecture 24: Galaxy Masses, Dark Matter, and Impact on Universe Expansion 11/19](#)
- Thanksgiving
- [Lecture 25: Cosmology and Early Universe 11/26](#)
- [video - What is the Universe expanding into?](#)
- [Olber's Paradox](#)
- [video - Why is the sky dark at night?](#)
- [Lecture 26: Early Universe: Creation of Matter, Test 3 overview 11/28](#)
- [Interview with Brian Cox on \(mostly\) science and society.](#)

Class 39: Through the Wormhole: Beyond the Darkness 11/30

- [Lecture 33: Structure of Milky Way, Galaxy Formation 11/14](#)
- [Animations - center of Milky Way Galaxy](#)
- [Video - Galaxy Formation](#)
- [M31\(Andromeda\) - M33\(smaller spiral\) Galaxy Interactions video](#)
- [Video - Andromeda and Milky Way Colliding Galaxies](#)
- [Lecture 27: Extra Dimensions and Multiverse 12/3](#)
- [Multiverse collisons?](#)
- [Sky and Telescope:Stephen Hawking's final paper on multiverse](#)

Class 41 - Test 3 - 12/5

Class 42 - Project Presentations 12/7

Final - Optional - 12/10 2:00