

Physics 105 – Ideas in Astronomy - Spring 2014 Catalog # 7649

Instructor - Prof. Tracey Jane Turner

Textbook:

## Cosmic Perspective Plus MasteringAstronomy with eText -- Access Card Package (7th Edition)

by Jeffrey Bennett, Megan Donahue, Nicholas Schneider, Mark Voit

Publisher: Addison Wesley Publishing Company

ISBN-10: **0321839501** | ISBN-13: **978-0321839503** | Edition: **7**

Math Background Needed:

Elementary arithmetic/algebra

Format: Lectures plus one evening session visiting the UMBC telescope.

Homework is set every week using the online homework system. Students are encouraged to work together to do well on homework but each must enter their own final homework solutions via the electronic web site.

Grade Breakdown is as follows:

Final Exam 25%

Two mid-term exams 20% each

Homework 30%

Attendance at telescope session 5%

Telescope:

There will be an opportunity to visit the telescope, students must attend one of several dates offered. This will replace one regular scheduled lecture.

Exams:

Students will take two mid-term exams and a final exam.

Mid-term exams test material covered since the previous exam. Only the final exam is comprehensive.

There are no makeup exams

There are no early or late exams

Mid-term exam dates will be announced two weeks into the semester, when the instructor has all student athlete schedule information.

Material to be covered:

### **Our Place in the Universe**

Understanding size-scales, overview of basic astronomy terminology

Key Events in the history of the Science of Astronomy

The ancient roots of astronomy, the Copernican revolution; orbits and Keplers laws

### **Matter and Energy**

Basics of atomic structure; kinetic, potential & thermal energy;  $E=mc^2$ ; conservation of energy.

### **The Laws of Motion**

What is speed versus velocity and what is acceleration; Newtons laws; gravity; tides; orbital energy; escape velocity, acceleration of gravity

### **Light**

Energy versus power; wave/particle duality of light; understanding wavelength, frequency and energy; the electromagnetic spectrum; emission and absorption lines; Doppler shift

### **Telescopes**

Class at the UMBC telescope, viewing the night sky and understanding how optical telescopes work and their different types; how a lens forms an image; refractors versus reflectors; telescopes across the spectrum

### **The Solar System and its formation**

The Nebular theory; gravitational collapse; types of planets; asteroids/comets; age of the solar system; other planetary systems

### **The Sun**

Nuclear fusion; structure of the Sun; sunspots

### **Stars**

Stellar characteristics/luminosities/temperature/mass; the Hertzsprung-Russell Diagram;

Star clusters

The Stellar Graveyard

How stars evolve; movement on the H-R diagram; low versus high-mass stars;

Binary systems; fate of a star; white dwarfs; neutron stars; black holes; gamma-ray bursts

### **Our Galaxy**

Structure of the Milky Way; star-gas-star cycle; Galactic environments; motion in the Milky Way; the mysterious Galactic Center

### **Other Galaxies and their Evolution**

Galaxy types/evolution; measuring cosmic distances/cosmic ages

### **Dark Matter and the Fate of the Universe**

What is the evidence for dark matter and what do we mean by this; DM in galaxies/clusters; the nature of DM; structure formation; the fate of the Universe

### **The Beginning of Time**

Conditions in the early universe; the Big Bang; discovery of the cosmic microwave background

The precise content of each exam will depend on how far the course has progressed at the appropriate time, and students will be briefed in class as to exactly what will be covered.