Vampy Astronomy Syllabus

This course is intended to be an accelerated introduction to important concepts in astronomy and will cover topics related to both observational astronomy and physical astronomy. While some of you may have some astronomy-related experience, the assumption is that each student is a tabula rasa when it comes to understanding the field. So, we will start at the ground level and work our way up. However, you should not interpret this to mean that the course will be easy! Unlike many introductory courses, yours will be a rigorous journey through the exciting field of astronomy.

Expectations

To help us achieve the goals of this course, I have some basic expectations for both our classroom and our observational settings.

Classroom Expectations:

1. You are expected to be respectful of your instructor, any guest speakers who may join us, and especially one another. You must also be respectful of other classes, all instructors and staff, and the WKU facilities.
2. You are expected to give 100% effort to the course. Evidences of 100% effort include (but are not limited to):
   a. Paying attention to your instructor and classmates.
   b. Engagement in lectures and class activities.
   c. Making contributions to the class by asking questions, offering knowledge based on your own understanding and experiences, and completing all assignments.
   d. Taking all assessments seriously.
3. You are expected to remain mindful that other classes and events will be occurring simultaneously with ours. Do not use loud voices or congregate in the hallways. Breaks are to be taken outside of the classroom facility.
4. You are expected to serve as outstanding representatives of the VAMPY program in all settings.

Observation Expectations:

We will have late night observations at off-campus settings. Here a few expectations for those trips:

1. You are expected to leave the site as you found it. Any trash must be picked up and disposed of properly.
2. You are expected NEVER to shine a light in anyone’s eyes. On average, it takes the eyes 30-45 minutes to adjust to nighttime conditions. When you shine a light in someone’s eyes, you deny them a half hour (or more) of quality observation time!
3. You are expected to remain engaged throughout the duration of the observational period. If you complete assigned activities, then practice previous skills. Observation time is NOT a time to sit and do nothing.

Failure to Observe Expectations:

Failure to observe the expectations outlined for this course will result in a conference with the instructor and, if necessary, referral to the VAMPY office.
Course Topics:

I. Observational Astronomy
   a. Naked-Eye Astronomy
   b. Constellations
   c. Viewing the Moon
   d. Viewing the Planets (Venus, Mars, Jupiter and Its Moons)

II. The Tools of Astronomy
   a. Light, Optics, Telescopes
   b. Gravity, Kepler’s Laws, and Orbital Motion
   c. Atoms and Spectroscopy
   d. Celestial Coordinate Systems

III. Planetary Astronomy
   a. Nebular Hypothesis
   b. Measuring Distances in the Solar System
   c. Features of Planets, Moons, and Other Objects in the Solar System

IV. Stars
   a. Measuring Distances to Stars
   b. Star Properties
   c. The Sun and Stellar Structure
   d. Lives and Deaths of Stars
   e. Special Star Types

V. Galaxies
   a. The Milky Way Galaxy
   b. Other Galaxies and Active Galaxies

VI. Cosmology
   a. Ancient Views on the Formation of the Universe
   b. Steady State Theory vs. The Big Bang Theory
   c. Evidence for Big Bang
   d. Hubble Constant

VII. Life Beyond Earth
By the end of this course, you will be able to:

1. Employ a working knowledge of celestial coordinates.
2. Make rough angular measurements between objects in the night sky using only your hand.
3. Locate significant constellations in the night sky.
4. Conduct family and friends on a tour of the night sky.
5. Explain what is meant by the statement, “When we look at the night sky, we look into the past.”
6. View the sun using safe procedures that protect your eyes from the harmful effects of solar light.
7. Use Snell’s Law to determine the change of path for light moving into a new medium.
8. Predict the location of images formed by the refraction of light through a thin lens.
9. Describe the various types of telescopes and the similarities and differences between them.
10. Discuss the advantages and disadvantages of refractor and reflector telescopes.
11. Describe three important features of a telescope and rank them in order of importance.
12. Construct a basic telescope using mostly materials that can be easily purchased at a hardware store.
13. Use spectroscopy to identify elements.
14. State the nebular theory for the formation of stars and planets.
15. Provide evidence in support of the nebular theory for the formation of stars and planets.
16. Explain how planetary distances are determined using the transit of Venus.
17. Describe both the Ptolemaic (geocentric) and Copernican/Galilean (heliocentric) views of the universe.
18. Describe features of various planets, moons, and other objects contained within our solar system.
19. Use various methods for determining the distance to stars and galaxies (parallax, stellar luminosity, Cepheid variable stars).
20. Engage various methods for determining the composition and properties of stars.
21. Classify stars based on their properties.
22. Interpret the meaning of HR-diagrams.
23. Describe the life cycles of various types of stars.
24. Describe exotic star types and the means we use to study them.
25. Describe ancient ideas concerning the formation of the universe.
26. Differentiate between the Steady-State and Big Bang theories of the formation of the universe.
27. Provide evidence in support of the Big Bang theory.
28. Explain the significance of the Hubble constant.
29. Discuss the conditions necessary for life as we understand it.
30. Explain the meaning of a habitable zone.