Received: July 12, 2013

1. **College:** Sciences and Mathematics

2. **Department:** Physics and Astronomy

3. **Course Status:** Existing; requires modification

4. **Course Prefix and Number:** AST 105

5. **Course Title:** Classical and Modern Astronomy

6. **Course catalog description:** This is a survey course that will stress the historical and descriptive aspects of our knowledge of astronomy. Topics include the study of light, stellar properties and evolution, galaxies, cosmology and an overview of planetary systems, including planets, moons, asteroids, comets and extrasolar planets.

7. **Number of semester credit hours:** 3

8. **Estimated enrollment per year:** 750

9. C**ourse prerequisites:** none

10. **Course is available online**

11. **Foundational Component Area**: Life and Physical Sciences

12. **Explain why this course fits into this foundation component area:** Astronomy is the study of the cosmos. All major natural science disciplines are utilized in its study including physics, chemistry, geology and biology. Astronomy has moved beyond the observational science it was 150 years ago. Using the advances in physics, we can now explain and predict natural phenomena. Whether studying the Sun for insight into Earth's climate, asteroid impacts to gauge human long-term survivability, or the search for extra-terrestrial intelligence, astronomy touches on a wide range of human experiences. The major aim will be to give each student an appreciation and understanding of the size, scale, and structure of the cosmos, to gain an understanding of the nature of science and astronomy and to see that the universe is comprehensible through the scientific principles that can be understood by everyone. In the laboratory students will follow the scientific method by making measurements, analyzing data, and developing a hypothesis to explain the data.

13. **Core Objectives**

We plan to create YouTube video segments to introduce each of the core objectives. Power Point slides will be added to the lab presentations for labs 2 and 3, where mastery of the core objectives will be demonstrated.

- **Critical Thinking-** This objective is at the very core of the scientific process through which we seek to understand the world around us. This understanding is continuously being developed as our tools become more refined, both observationally and theoretically. Critical thinking skills are taught in lecture, when the scientific process is first introduced, through readings and YouTube videos. The lecture draws out the story of how our discoveries are made and the thought process that leads to progress. This process requires innovation, synthesis of various lines of evidence, and sometimes leaps of faith. These skills are continually developed through question and answer in lecture discussions. In laboratory, students will apply critical thinking when given observational data sets to analyze and evaluate and draw conclusions. Mastery of critical thinking skills will be demonstrated in the **Lunar Phases Experiment**. This experiment is Lab 2 in the co-requisite lab, but unlike most of the other experiments it requires a formal, detailed write-up. Questions for this lab will bring the students through the steps in critical thinking required to successfully predict lunar phases (CO 1). (The **Lunar Phases Experiment** will be used to address mastery of skills for COs 1, 2, and 4.)
- **Communication Skills-** In the lecture portion of this course, students will be taught communication skills which will include effective development, interpretation, and expression of ideas through written and visual communications. Lectures and instructor led class discussions will be used to accomplish this. In laboratory, students will analyze data sets by the construction of graphs and charts. They will present their findings of each laboratory exercise in the form of written lab reports that include measurements and graphs, computations and discussion questions. Students will demonstrate their communication skills in the **Lunar Phases Experiment** mentioned above. The formal lab write-up associated with this experiment will require each student to write results and draw conclusions (written communications) based on data tables and graphs (visual) produced in the exercise.
- **Empirical and Quantitative Skills-** Data analysis is a crucial part of the scientific method. In the lecture portion of this course students will be taught how to correctly collect and analyze scientific data. They will practice empirical and quantitative skills in the lab portion of this course where their skills will improve with each experiment. They will learn how to make accurate measurements, do necessary calculations, and perform error analyses. Mastery of empirical and quantitative skills will be demonstrated in the **Measurements Lab** (Lab 3) where students will be required to submit a formal write-up of the experiment. This write-up will include manipulation and analysis of numerical data and informed conclusions. Topics covered include significant figures, accuracy and precision, combining measured numbers, scientific notation and units.
- **Teamwork-** Students commonly work in teams of 4-5 in the laboratory and monitoring by the instructor ensures that the teams work together. Early in the lecture portion of the course students will be instructed on the elements of good teamwork through assigned reviews of YouTube video segments and through Power Point slides in the pre-lab

discussion. Mastery of teamwork with be demonstrated in the **Lunar Phases Experiment**. This exercise itself follows on a study that addresses the question, "What Causes the Phases of the Moon." http://www.youtube.com/watch?v=RY8izdr4cU4). The teams will then collect and analyze data, draw conclusions based on differing viewpoints and communicate findings in a written report.

Contact person for questions about this submission:

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