Preliminary Syllabus
Sci/Math Ed. Astronomy: Our Place in Space (Fall 2005)

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Course Objectives:
The primary goals of this course are to:

- Deepen participants' content knowledge of astronomy, with a focus on "our place in space".
- Increase students familiarity with hands-on activities and demonstrations that can be used with pre-college students,
- Introduce students to some of the major findings of astronomy education research and how they apply to teaching and learning of astronomy concepts in pre-college classrooms, and
- Increase students' awareness of the motions and objects in the sky, and the patterns of seasons and lunar phases.

The overarching goal is to increase the comfort level of students in their own teaching of astronomy.

Planned Topics and Activities

1. Scale in the Solar System/Solar System Inventory
    - Importance of scale models in astronomy
    - *Scale Model Solar System* activity w/ comet/asteroid extension
    - Scale in the Earth and Moon system
    - Pre-testing
    - Begin lunar log

2. Reasons for the Seasons
    - Common Naïve Conceptions
    - *A Private Universe* tape/DVD
    - GEMS Guide: *The Real Reasons for Seasons*

3. The Sun and Light
    - Energy from the Sun
    - Sunspots and the Sunspot Cycle
    - Rotation of the Sun
    - The Sun as a Star

4. Earth and Moon
    - Return to Scale in the Earth-Moon system
    - Modeling lunar phases
    - Modeling eclipses
    - Gravity on the Moon
    - Geology of the Earth and Moon

5. Main Sequence Stars
    - *Sizes and Distances of Stars* activities
    - Parallax activity
    - Stars in the solar neighborhood

6. Star Birth
    - *Star Birth* activity
    - Using online data of star forming regions
    - Theories of star formation
    - Open clusters

7. Lifetimes of Stars
    - The age of the solar system
    - *Lifetimes of Stars* activity
    - The history of the solar system
    - The fate of the Sun

8. End States of Stars
    - Leaving the Main Sequence
    - Giants and supergiants
    - *Death of Stars* activity
    - White dwarfs
    - Neutron stars and pulsars
    - Black holes and gravity

9. Galaxies and Globular Clusters
    - Our Milky Way
    - Types of galaxies
    - Galaxy rotation
    - Star formation in galaxies
    - The HR diagram and globular clusters

10. Observing the Night Sky (part 1) Richardson ISD planetarium?
    - Astronomical coordinates
    - Using planispheres
    - Constellations
    - Planetary motions
    - Latitude, season, day, and night
11. Observing the Night Sky (part 2)

- Types of Telescopes
- Using Telescopes
- Deep sky objects
- Observing with binoculars
- The unaided eye

12. Hot topics in Astronomy
    - The search for extrasolar planets
    - *Planet Hunting* activity
    - Cosmology: the Big Bang and the fate of the Universe

Texts and Materials

Recommended Texts/Resources:

1. *The Universe at Your Fingertips* (Ed. Andrew Fraknoi) A comprehensive astronomy resource book for teachers from the Astronomical Society of the Pacific. $34.95
2. *The Real Reasons for the Seasons* (GEMS Guide) $17.95
3. *Earth, Moon, and Stars* (GEMS Guide) $13.50
4. An astronomy textbook will not be required, but can be a valuable resource. I will be happy to make textbook recommendations depending upon individual student needs.

Required Equipment:

- A scientific calculator will be useful in most, if not all, class meetings. Please bring yours to each class session.

- Access to a computer and the Internet outside of class.

Recommended Software:

- Microsoft Word (UTD has a special license agreement with Microsoft. Microsoft Office, which includes MS Word, is available at the campus technology store or HiEd (http://www.hied.com/ut/) off campus office for approximately $6 per CD.)

Grading Policy:

- **Class Participation** (20%): Much of the class will be done in the style of an educator workshop. You will be expected to be an active participant in all activities and in discussions and contribute to the learning environment for your classmates. The quality of your

contributions and the evidence of deep thinking and development of understanding will be part of this grade.

- **Small Projects** (20%): A small project is a catchall term for mini-papers, out-of-class experiments, and homework assignments. These projects are meant to extend your learning beyond the classroom setting. Examples of small projects:
    - Matching TEKS across grade levels to specific astronomy topics
    - Observing objects in the sky.
    - Presenting brief reports of astronomy in the news.
    - Out of class explorations of astronomy Web resources.
    - Measuring the temperature of the Sun with a cup of water.

- **Weekly Quizzes** (40%): Every class meeting, one or more thought questions or simple problems will be asked of the class to probe each student's understanding of the topics discussed. Answers to the journal questions must be in your own words, and when mathematical, you must show your work. Questions may take home or given in class. All quizzes will be graded on a 4 point scale:

    4 point: Excellent. Little or no corrections are necessary.

    3 points: Good. Minor problems with the answer.

    2 points: Fair. Requires at least one major correction or revision. Consider redoing the quiz.

    1 point: Poor. Serious flaws in the answer. Turning in a redo of the quiz is strongly recommended.

    0 points: Did not address the question asked**.** Please try again.

- **Revisions:** Whenever reasonable, you may redo most take home quizzes and small projects to earn back up to half of your missed points. Such revisions must be submitted in a timely manner, and will be held to the same standards as the original assignment. We will discuss quiz questions in class. Revisions must demonstrate an individual understanding of the material rather than a summary of the class discussion.

- **Final Project and Presentation** (20%) You have your choice of final project for this class. All projects will include a final presentation.

You may work with a partner, but all projects must be approved by the instructor.

- A unit of 3-4 *complete* original lesson plans related to astronomy.
- A "proposal" for a new astronomy space-based mission.
- A term paper *and* accompanying poster or PowerPoint presentation on an astronomy topic.
- A children's book on astronomy

Important: All assignments must be completed in a timely manner and with a quality of work that reflects the level of this course. Accepting late assignments is at the instructor's discretion. **You are encouraged to discuss class work with your classmates. However, all assignments submitted for credit must be the work of the students submitting the assignments. Plagiarized assignments will *not* be accepted for credit.** Weekly quizzes provide the best method of gauging an individual students understanding of the physics concepts covered in this course. A final exam may be required for students who have three or more weekly quiz grades of 50% or less. (The 50% cutoff does not include any additional points earned due to subsequent revisions.) The final exam grade will replace the quiz grades in the calculation of the final grade in the class.

Note These Important Dates:

- **September 15:** A regular class night will not be held. This class will be combined with the 6^{th} and 7^{th} grade grant class in a discussion of lunar phases on a Monday night to be determined.
- **October 27:** Class is cancelled to allow course participants to attend CAST in Houston.
- **Final Exam Period:** Our final exam period will be used for lesson plan presentations.