AEM 120 **Aerospace Science for Educators** **Fall 2006**

Dr. Keel TTh 5:00-8:00 p.m. 227 Gallalee
Office 311B Gallalee; hours 1:15-3:15 Wednesday and 1:30-3:00,
Tuesday, other times by appointment (348-1641 or wkeel@ua.edu)

Texts:

Dickson, T. (2006) *Nightwatch: a practical guide to viewing the Universe* (Camden House)

Hopkins, R. (2001) *Objects in Motion* (Tuscaloosa: University of Alabama. Academic Publishing Services)

Sunal, D. (2001) *Model of Nearby Space* (Tuscaloosa: University of Alabama. Academic Publishing Services)

Course Description: This course provides pre-service teachers with science literary in several linked fields (physics, aeronautics, astronom, space science) using an interdisciplinary problem-solving approach. This course is open only to education majors (elementary and secondary, undergraduate and graduate students). This is a 4-credit-hour course, as in other lab-based science courses, taught in two 3-hour blocks each week.

Other materials:

Star and Planet Locator
scientific calculator
drawing compass
direction compass
protractor
30-cm ruler
scissors
Skill level 1 flying model rocket and engine (available at local hobby shops)

Course content: The course includes two main units: (1) Objects in Motion (motion, physics, flight, and the atmosphere - why airplanes fly and orbiting spacecraft don't fall to Earth), amd (2) the Earth in Space. Each student must participate in several out-of-class activities. There may be field trips to the Tuscaloosa Airport, McWane Center in Birmingham, or US Space and Rocket Center in Huntsville. There will definitely be sessions for observing the sky both from campus and the darker location of Moundville. Visits to area schools to put some of this knowledge into practice may be arranged.

Course purpose: This course is designed to foster familiarity with the basic concepts needed to teach space science and its related disciplines effectively at the K-12 levels. The layout of the course and its activities are designed to encourage reflective, analytical thinking and students' own structuring of their ideas. Students should develop (1) meaningful understanding of basic scientific concepts, (2) understanding of the use of these concepts in approaching engineering and design problems, (3) critical thinking skills, (4) an appreciation of science as part of daily life in contemporary American society, and (5) an appreciation of the role and practice of inquiry-based science education. Class discussions will therefore include both the scientific and pedagogical issues; demonstrations will center on those that students can carry into the K-12 classroom. Wherever appropriate, we will use a student-centered approach rather than hours of lecture.

Class activities: Activities will involve a sequence of exploring the problem, inventing solutions, and expanding them for application in additional situations. (Yes, this sounds pretentious when we're talking about a glider made of straws and paper, but the principle's the thing). This should model the learning cycle as used at all educational levels. The expansion phase will lead to further activities, discussion, and connection to field trips.

Material assigned for each class should be read or completed before that class. Each student should contribute regularly to the issue at hand in class discussions - based not only on their own experiences, but readings, class activities, and reflections on nature driven by their own curiosity. Some activities will be group projects, where communication and cooperation will pay off.

Grading: will be based on:

Regular exams (20%)
Unannounced quizzes (10%)
Class participation (25%)
Class activities, lesson plans, labs, projects (15%)
Field trips and observations (15%)
Comprehensive final exam (7:00-9:30 p.m. Tuesday, December 12) (15%)

Feedback and grade delivery: I will email each student their grades to date after each set of graded work, as soon as the grades are complete.

Weather-dependent plans: Check email and class WWW site for any late changes in outside activities (i.e. sky viewing) Outside activities are often dependent on weather and subject to late change. A late sky-viewing night may mean that the next class is cancelled.

Class Portfolio: Students will each need to maintain a portfolio of class-related material - notes, observations, thoughts, weekly news or summary article reviews. When using the web, keep an eye out to make sure you're using reputable sources! This portfolio will include your field notes on astronomical and meteorological matters - notes, photos, sketches.

Attendance policy: This is a strongly participatory class, so attendance is important - in short show up and sign in. Some work (quizzes) can be made up in the event of severe misfortune, but outside activities cannot.

Special accomodations: Accomodations for special physical needs or test time, etc., can be made when appropriate. All such arrangements must be made through the UA Office of Disability Services.

Academic misconduct: As painful as it is for me to even bring this up, offenses such as plagiarism or forging someone else's signature on a class sheet are in violation of the University code of student conduct (as well as being wrong) and will be reported to the appropriate Dean's office for investigation and possibly disciplinary action.

Course outline: This is an outline of what we expect to cover during the class periods. This schedule is subject to change depending on the scheduling of outside activities.

Date	Topic
24 Aug	Course introduction: why this stuff matters
29 Aug	Science and numbers; units, physical concepts
31 Aug	Newton's Laws
5 Sep	Group demonstrations and critiques (OIM lab book); orbits
7 Sep	Orbits, centrifugal/centripetal forces
12 Sep	Weightlessness
14 Sep	Fluids - Bernoulli and Pascal, gas laws, graphing
19 Sep	Bernoulli airflow activity; wind tunnel vsiit? Prepare a lesson
21 Sep	Practicing flight: the soda-straw glider
26 Sep	Rocket-car activity; review for midterm
28 Sep	Exam 1 (just in time for midterm grades)
3 Oct	Present/critique lessons
5 Oc	Earth in Space
10 Oct	Directions and angles; astrolabe activity
12 Oct	Constellation/star presentations; sky viewing?
17 Oct	Stars
24 Oct	Using SkyGlobe; telescopes and binoculars
26 Oct	The deep sky
31 Oct	Solar-system activity; walk off planets' orbits to scale
2 Nov	Planets (hey, just what is a planet?)
7 Nov	Mission to Mars?
9 Nov	Sun/moon, phases, tides
14 Nov	Present topical demonstrations
16 Nov	Small bodies in the solar system, auroras
28 Nov	exam II
30 Nov	Review, prepare for model of nearby space
5 Dec	Make the model of nearby space
7 Dec	Final lesson presentations, overall review