

PHYS-650 “Aeronomy” Course Syllabus Fall 2006

1. Course information: PHYS-650 “Aeronomy”, 3 credits, 9:45 am to 11:15 am Tuesday and Thursday, NSCI room136, Pre-requisites: *PHYS 312, 332, 411, or equivalents; graduate standing or permission of instructor.*
2. Instructor information: B.J.Watkins, 708A Elvey, Tel: 474-7479, Email: watkins@gi.alaska.edu Office hours: Any time at GI office
3. Course readings/materials: No required text for class; students are not required to purchase a textbook. A number of texts will be used and these will be referenced in class and put on reserve in the GI/IARC library when needed. Some general background books are listed below. Course material will be taken from these books plus research papers.

Hargreaves “The Solar-Terrestrial Environment” Cambridge Press 1972

Banks & Kockarts “Aeronomy” Academic Press 1973 (two volumes)

Rees “Physics & Chemistry of the Upper Atmosphere” Cambridge Press 1972

Chamberlain and Hunten “Theory of Planetary Atmospheres” Academic Press 1987

Brekke, A., “Physics of the Polar Upper Atmosphere”, Wiley 1997

Schunk, R.W., and A.F.Nagy, “Ionospheres”, Cambridge, 2000

Lewis J.S. “Physics and Chemistry of the Solar System”, Elsevier 2004

Brasseur, et al, “Atmospheric Chemistry in a Changing World”, Springer 2004

Pross, Physics of the Earth’s Space Environment, Springer, 2004

4. Course description: The same as the catalog, but the university requires it be duplicated here in the syllabus, so here it is, copied from the catalog. *‘The physical and chemical processes that govern the response of planetary atmospheres to solar radiation and energetic particles; the formation of and characteristic processes in the layers within the ionosphere; and basic magneto-ionic theory. Includes principles of remote sensing by radar techniques.’*
5. Course Goals (more general) and Student Learning Outcome (provide examples). I do not know what this means and it again it is something the university wants mentioned in the syllabus. So here is my attempt to satisfy this requirement: *The goal of this course is for the instructor to teach this course to students with the general theme mentioned in the catalog course description, and specifically covering the topics listed under item 7 below. The student learning outcome is that students taking the course will, at the conclusion of the course, know something about those topics, and will be able to pass the final exam and fulfill the majority of homework exercises.’*

Additional Notes:

(1) There are two complementary courses PHYS-640 “Auroral Physics” and PHYS-660 “Geophysical Fluid Dynamics”. This course “Aeronomy” will not duplicate material covered by those other two courses and therefore will not cover (except at a low level) optical auroral phenomena and instruments, or atmospheric wave and fluid dynamics.

(2) There will be many class handouts. You will be expected to keep those handouts in an

orderly 3-ring binder notebook. At the end of the course you should then have a notebook(s) that can be used for future reference.

6. Instructional methods: describe the teaching techniques (e.g., lecture, case study, small group discussion, private instruction, studio, instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.) This is also a new university requirement for syllabi. For this course the answer is “lecture”.

7. Course calendar: a schedule (daily or weekly major topics or assignments).

The following weekly topics (eg (a) in first week) will be covered

(a) Overview of the earth’s atmospheric regions

The terrestrial planets (Mars, Earth, Venus); a brief comparative survey of atmospheres, climate history, etc

(b) Thermospheric models (eg MSIS)

Scale height, distribution height.

Solar indices

(c) Collisions and diffusion processes

(d) Ionospheric Regions; physics and chemistry

(e) Large-scale electric fields

Currents and electrical conductivity

(f) Magnetic indices, geomagnetism.

(g) D-region/mesosphere chemistry; positive ions, negative ions, water cluster ions

(h) Solar irradiance, atmospheric attenuation, optical depth

(i) Magneto-ionic theory; radio absorption

(j, k) Instrumentation

Ionosonde

Riometer

Magnetometers

Radars: meteor, MF, turbulence-scatter, incoherent-scatter

Space-craft instruments:

Langmuir probe, mass spectrometer, and few more if time permits.

Optical Instruments:

(possibly a brief review only as these are covered in PHYS-640

(l) Meteors, metal ion deposition from meteors, sporadic-E layers

(m) Stratospheric ozone chemistry

(n) Ionospheric modeling and simulation

8. Course policies: specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity. *The grade for the course will be based on homework problems and papers, and final exam.* Due to the nature of the course, class attendance is important. A number of the topics are fully appreciated and understood mainly through class discussion. Students should expect a lower grade if more than 2 classes are missed

9. Evaluation: specify how students will be evaluated, what factors will be included, their relative value, and how they will be tabulated into grades (on a curve, absolute scores, etc.) *Final grade will depend on attendance 15%, homework 40%, final exam 45%. Absolute scores will be used in the grading.*

10. Support Services: describe the student support services (local and/or regional) appropriate for the course. The university requires this information be provided; my answer is *“no support services will be provided except the availability of a chair for you to sit on, and no parking space or plug-in is guaranteed.”*

11. Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. State that you will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities." *I will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities. If you have a disability it is your responsibility to notify the instructor, and to explain the nature of the disability, and how this may affect your attendance, or ability to function with respect to the class expectations.*