ENG EC566 The Atmosphere and Space Environment

2008-2009 Catalog Data:
Introduction to the upper atmosphere and ionosphere. The dynamic, electrodynamic, radiative, and chemical processes occurring in the atmosphere from ground level to near-space are developed to establish the conditions found in the upper-atmospheric/ionospheric region. Recent offerings have included numerical simulation of the ionospheric electron density profile. Numerical experiments that change the solar input and neutral atmospheric density, composition, winds, and temperature are then run to study the response of the ionosphere to these factors that control the ionosphere. Recommended for graduate students and advanced undergraduate students in engineering, astronomy, and physics and those with interests in environmental topics.

Status in the Curriculum: Elective

Class/Lab Schedule:
Lecture: 4 hours/week

Textbooks and other required materials: course notes handed out in class

References:
Rishbeth and Garriott, "Introduction to Ionospheric Physics"
Banks and Kockarts, "Aeronomy"
Schunk and Nagy, "Ionospheres"

Coordinator: William Oliver, ECE

Prerequisites by topic:
Modern physics, e.g., PY313
Differential equations, e.g., MA226
Scientific programming language, e.g., MATLAB (EK127)

Goals:
Provide an introduction to the fundamental processes operating in the atmosphere and near-earth space; act as a feeder course for atmospheric and space research.

Course Outcomes:
1) UNDERSTAND the structure of the atmosphere from the ground to space
2) UNDERSTAND the process of photoionization of atmospheric particles by solar UV and X-rays
3) UNDERSTAND the chemical reactions of atmospheric ions with neutral gas particles and electrons
4) UNDERSTAND the diffusion of particles under the effect of gravity
5) UNDERSTAND the effects on the atmosphere and ionosphere of global warming and atmospheric pollutants
6) UNDERSTAND the principles of discretization and numerical solution of a PDE

bounded in space and with initial time condition

7) DESIGN computer code to solve a PDE numerically
8) APPLY said computer code to the case of the ionospheric electron density
9) ASSESS the behavior of the ionosphere by varying all solar and atmospheric stimuli in the computer code and observing the change in behavior
10) REPORT findings of each numerical experiment in self-standing write-ups intelligible to the scientific lay-person

Course Outcomes mapped to Program Outcomes:

Program:	**a**	**b**	c	d	e	f	g	h	i	j	k
Course:	7-9	7-9	-	-	7,8	5	10	5	-	5	7-8
Emphasis:	5	5	-	-	4	2	2	2	-	2	4

1=not at all; 5=a great deal;

Topics in Project Assignments:

1) Design computer code to solve a PDE numerically
2) Apply said computer code to the case of the ionospheric electron density
3) Assess the behavior of the ionosphere by varying all solar and atmospheric stimuli in the computer code and observing the change in behavior

Contribution of Course to Meeting the Professional Component:
Engineering topics: 40%
Math & Basic Science: 50%
General Education: 10%

Prepared by: William L. Oliver, Professor Date: June 4, 2009