

Clark Atlanta

Senior  
CAU Integrative + Systemic

**ATTACHMENT B**

**PHYSICS/BIOLOGY/CHEMISTRY  
INTEGRATIVE AND SYSTEMIC APPROACHES TO UNDERSTANDING EARTH SCIENCES**

**Description:**

PHY 420(?) INTEGRATIVE AND SYSTEMATIC APPROACHES TO UNDERSTANDING EARTH SCIENCE..

Credit hours: 3 lecture hours. Prerequisites: Completion of first semester junior (level) courses in biology, physics, chemistry, political science, mathematics, or computer sciences. The course 'II explore methods of problem solutions that integrate working knowledge of various subdisciplines comprising Earth System Sciences. Students will be required to assimilate theory and principles across ESS subdisciplines, as well as the mathematical and computational subdisciplines. Case studies of three natural disasters will be the focus of this interdisciplinary course, thereby allowing students working in multidisciplinary teams to address real world problems through the application of academic knowledge; *in situ*, hands-on, real time scientific data; and use of novel, computer-based techniques. This combination of academic, research and practical, hands-on approach is expected to significantly enhance students ability to think critically across various disciplines.

**Enrollment:** Class will be limited to 15 students. Students will be divided into three groups (5 students each) for discussions and completion of group projects/assignments.

**Lead Course Instructors:**

**Textbook:** Given the interdisciplinary and multidisciplinary nature of the course, no single text book will be utilized for the course. Instead, a carefully prepared set of selected readings from various sub-disciplines will be placed upon reserve in Library East for student use.

COURSE CONTENT

This capstone Earth System Science course will be compartmentalized into two (2) main parts. Part I of the course will include reviews and overviews of

1. the cosmic/macro scale view of Earth Science and ESS (Introduction)

Representative topics:

--atmospheric physics (temperature, humidity, winds, rainfalls radiation balance)

--atmospheric chemistry (ozone, greenhouse gases, chemical reactions in the atmosphere)

--oceans (sea surface temperature, circulation and heat transport, marine biosphere, topography and roughness)

-- land (land biosphere, vegetation structure and functions, ice and snow cover, water cycle, radiative properties, soil moisture)

-- solid Earth (crustal movements, gravity and magnetic fields)

2. the scientific components related to each of the three natural disasters identified for case studies in the course (definition, cause, manifestation, etc. of each natural disaster)

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3. philosophy of science; scientific method; scientific critique; scientific writing
4. critical thinking: definition, how to ... ; tips for ... ; etc.
5. use of the Internet and WWW to access information and data
6. modeling: what is it; components of modeling; constructing models
7. computer programs and modules for use in constructing appropriate models for each case study

Part II of the course will include student participation in discussions, data collection/manipulation, library searches/data acquisition and hands-on approaches to completing group assignments/projects relative to the three case studies on natural disasters. In this portion of the course, students will;

- (a) use computer and applicable software to simulate initiation, development, tracking, impact and aftermath of each of the three natural disaster case studies. It is anticipated that various computer program, software packages and modules will be utilized here, including but not limited to, COMET, STELLA, PATHFINDER, and EARTNET.
- (b) collect, and if necessary, generate data/measurements (remote sensing, *in situ* or archived) from applicable sources for use in completing assignments.

The Spring 1997 piloted course will focus on three natural disasters (I.e., three case studies):

- a. floods      b. hurricanes      c. earthquakes

Components and points which students must address as part of their projects and assignments to gain an holistic view of these three natural disasters include:

1. impact of each case study on natural resources
2. economic impacts
3. possible threats to national security
4. human impacts: health related issues; individual to population levels
5. environmental impacts: individual organismal to population levels; biodiversity and changes in habitat-, species composition; migrations; evolutionary process; restoration; pollution; etc.
6. policy issues: possible modifications; changes; implementation of new ones; awareness and education; and,
7. technology: from the perspective of usage, current practices and new advances.