ROLLINS SCHOOL OF PUBLIC HEALTH
EMORY

DEPARTMENT: Environmental Health

COURSE NUMBER: EH SECTION NUMBER: 587 SEMESTER: Spring 2016

CREDIT HOURS: 3

COURSE TITLE: Introduction to satellite remote sensing of the environment and its applications in public health

INSTRUCTOR NAME: **Yang Liu**

INSTRUCTOR CONTACT INFORMATION

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SCHOOL ADDRESS: CNR Bldg. 2031

OFFICE HOURS: **By appointment**

BRIEF COURSE DESCRIPTION

Geospatial information collected from satellite remote sensing has become a powerful tool in environmental and public health science and policy making. However, public health researchers usually lack training to benefit from this rapidly evolving technology. This introductory course provides students a broadened view of environmental sciences with satellite remote sensing technologies, and basic skills for geospatial data analysis. It covers the history, major instruments, and capabilities of satellite remote sensing as well as the basic scientific principles behind it. Students will learn (1) the terminology and data products of both land and atmospheric remote sensing such as those from MODIS and Landsat, and (2) the basic strategies and techniques to analyze geospatial data in free (e.g., Echo Reverb, GIOVANNI and HDFView) and professional grade (ENVI and ArcGIS) software packages. Training modules for ENVI and spatial analysis tools in ArcGIS will be provided. Various case studies and lab exercises demonstrate the applications of satellite remote sensing in land use change and air pollution characterization, climate change and other areas related to public health. The final project allows the students to apply satellite data together with other information to solve a problem of their interest.

SCHOOL LEVEL, DEPARTMENT, AND/ OR PROGRAM COMPETENCIES

The course is designed to address the following RSPH core and EH department MPH, MSPH, and PhD competencies:

RSPH core:

- Use analytic reasoning and quantitative methods to address questions in public health and population-based research;
- Describe environmental conditions, including biological, physical and chemical factors, that affect the health of individuals, communities and populations; and
- Develop the capacity for lifelong learning in public health

EH MPH and MSPH:

- Describe major environmental risks to human health ranging from the local to global scale
- Assess the sources and movement of contaminants through the environment
- Characterize the magnitude, frequency and duration of environmental exposures

EH PhD in EHS:

- Utilize advanced methods in exposure assessment of environmental contaminants
- Design novel research projects to examine key challenges in field
- Disseminate research findings in multiple formats

LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

This course contributes to the following learning objectives for the MPH students in Environmental Health:

(1) Explain general principles of environmental sciences and apply them to environmental pollution exposure studies related to human health;
(2) Identify and explain environmental pollution risks to human health ranging from urban to the global scale, and explain how to assess the magnitude of these hazards.

This course also contributes to the following learning objectives for the MPH students in Global Environmental Health:

(1) Identify and describe environmental health problems in developing countries;
(2) Assess the source and movement of contaminants in the environment; and
(3) Characterize and quantify exposures to environmental pollution.

In addition, this course can broaden students' view when designing their practicum and thesis.

EVALUATION

Labs: 30 points (10 each)
Homework: 30 points (10 each)
Final project: 40 points (study design 10, data and tools 10, discussion 10, presentation 10)

Grading:			
	≥ 90 points A	85 – 89 points	A-
	80 – 84 points B+	75 – 79 points	B
	70 – 74 points B-	50 – 69 points	C
	< 50 points F		

For the project, students will be expected to work independently or form small groups depending on the class size, select a research topic related to environmental pollution and public health, search for available satellite data, analyze the data, and report their findings in a report and an oral presentation. Further details will be provided in class.

ACADEMIC HONOR CODE

The RSPH requires that all material submitted by a student in fulfilling his or her academic course of study must be the original work of the student.

EH 587: INTRODUCTION TO SATELLITE REMOTE SENSING OF THE ENVIRONMENT AND ITS APPLICATIONS IN PUBLIC HEALTH

Class Time and location: Tuesday 8:30 am – 9:50 am at Math and Science Center Library (E301A)
Thursday 10:30 am – 11:50 am at GCR L45

PREREQUISITES:

Experience with GIS at the level of INFO 530 or INFO 532 is important for successful completion of this course. Contact course instructor if unclear about the GIS requirements. Basic knowledge of physics is helpful but not required. This course relies heavily on online data and resources. Math&Sci E301A has computer workstations fully equipped with all the major GIS software packages. Everyone is expected to bring their laptop (or share with another student) to Thursday's class.

TEXT AND READINGS:

There are no required textbooks. Optional texts:

1. *Introduction to the Physics And Techniques of Remote Sensing*, by Charles Elachi and Jakob van Zyl, 2nd Edition (2006), John Wiley & Sons.
2. Remote Sensing of the Environment: An Earth Resource Perspective, by John R. Jensen, 2nd Edition (2007), Pearson Education.
3. *Remote Sensing and Image Interpretation*, by Thomas M. Lillesand and Ralph W. Kiefer, 4th Edition (2000), John Wiley & Sons.

Text books, other reading materials, lecture sides, and lab materials will be distributed via course Blackboard site.

Week	Date	Topics
1	1/12 E301A	Course Introduction ArcGIS refresher
	1/14 GCR L45	Concept of remote sensing, behavior of light
2	1/19 E301A	Introduction to land remote sensing (guest lecture by Michael Page)
	1/21 GCR L45	Atmospheric physics refresher (guest lecture by Dr. Eri Saikawa)
3	1/26 E301A	Lab 1: Exploring Landsat imagery with ERDAS / ArcGIS - Image processing
	1/28 GCR L45	Introduction to land remote sensing continued
4	2/2 E301A	Lab 2: Exploring Landsat imagery with ERDAS / ArcGIS - classification
	2/4 GCR L45	History and terminology of satellite remote sensing
5	2/9 E301A	Lab 3: Working with elevation data
	2/11 GCR L45	**Lab 1 report due** Case study using Landsat, ERDAS and ArcGIS: Vegetation Reclamation on Surface Mines in Appalachia - introduction
6	2/16 E301A	**Lab 2 report due** Case study using Landsat, ERDAS and ArcGIS: Vegetation Reclamation on Surface Mines in Appalachia - data and methods

	2/18 GCR L45	Introduction to atmospheric remote sensing: theories
7	2/23 E301A	**Lab 3 report due** Case study using Landsat, ERDAS and ArcGIS: Vegetation Reclamation on Surface Mines in Appalachia – supervised classification
	2/25 GCR L45	Case study using Landsat, ERDAS and ArcGIS: Vegetation Reclamation on Surface Mines in Appalachia - results and discussion How to critique a data analysis paper
8	3/1 E301A	Atmospheric remote sensing technology and data products Introduction to MODIS and VIIRS **Homework 1: MODIS data access using LAADS**
	3/3 GCR L45	Application of satellite aerosol RS in predicting ground-level PM2.5 concentrations **Critique assignment**
9	3/8	Spring break
	3/10	Spring break
10	3/15 E301A	**Lab 4: Satellite air pollution data exploration with GIOVANNI**
	3/17 GCR L45	Class presentations: paper critique
11	3/22 E301A	Case study using MODIS, ERDAS and ArcGIS: State Line Power Plant Closure: Effects on air quality of Chicago - introduction
	3/24 GCR L45	Introduction to remotely sensed fire products **Homework 1 due**
12	3/29 E301A	Case study using MODIS, ERDAS and ArcGIS: State Line Power Plant Closure: Effects on air quality of Chicago - data and methods
	3/31 GCR L45	Case study using MODIS, ERDAS and ArcGIS: State Line Power Plant Closure: Effects on air quality of Chicago - results and discussion
13	4/5 E301A	Analysis of the 2003 European heat wave with NEO
	4/7 GCR L45	**Final project proposal presentation**
14	4/12 E301A	Real-world applications of satellite remote sensing In-class office hour on project development
	4/14 GCR L45	Additional geospatial data products (ASTER GDEM)
15	4/19 E301A	In-class office hour on project development
	4/21 GCR L45	In-class office hour on project development
16	4/26 E301A	**Term Project: final presentations / discussion**
	4/28 GCR L45	Individual appointment with instructors for final grade