DEPARTMENT: Environmental Health

COURSE NUMBER: EH  SECTION NUMBER: 590R  SEMESTER: Spring 2019

CREDIT HOURS: 2

COURSE TITLE: Satellite remote sensing for health and environmental research

INSTRUCTOR NAME: Yang Liu

INSTRUCTOR CONTACT INFORMATION
EMAIL: yang.liu@emory.edu
PHONE: 404 727-2131
SCHOOL ADDRESS: CNR Bldg. 2031
OFFICE HOURS: By appointment

COURSE DESCRIPTION
Geospatial information collected from satellites has become a powerful tool in environmental and public health science and policy making. This introductory course provides students a broadened view of environmental sciences with satellite remote sensing technologies and their potential applications. It covers the history, major instruments, and capabilities of Earth observing satellites as well as the basic scientific principles behind them. 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 techniques to analyze geospatial data in free (e.g., GIOVANNI and Panoply) and professional grade (e.g., ArcGIS) software packages. Training modules for 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, water resources/pollution monitoring, air pollution characterization, and other areas related to public health.

SCHOOL AND DEPARTMENT COMPETENCIES

RSPH Foundational Competencies:
Evidence-based Approaches to Public Health:
• Select quantitative and qualitative data collection methods appropriate for a given public health context;
• Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software as appropriate; and
• Interpret results of data analysis for public health research, policy or practice.

Communication
• Communicate audience-appropriate public health content, both in writing and through oral presentation

Systems Thinking
• Apply systems thinking tools to a public health issue

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;

PhD in Environmental Health Sciences:
• Utilize advanced methods in exposure assessment of environmental contaminants
• Interpret advanced methods in exposure assessment of environmental contaminants

LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

This course contributes to the following learning objectives for the EH MPH students:

• Understand the basic concepts, terminology, and data structure of satellite remote sensing data.
• Explain general principles of environmental sciences and apply them to environmental pollution exposure studies related to human health;
• 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 GEH MPH students:

• Identify and describe environmental health problems in developing countries;
• Assess the source and movement of contaminants in the environment; and
• Characterize and quantify exposures to environmental pollution.

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

EVALUATION

<table>
<thead>
<tr>
<th>Labs/homework:</th>
<th>90 points (15 each lab or homework assignment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper critique:</td>
<td>10 points</td>
</tr>
</tbody>
</table>

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

COURSE POLICIES

As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Equity and Inclusion, 404-727-9877.

RSPH POLICIES

Accessibility and Accommodations

Accessibility Services works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, you must contact the Office of Accessibility Services (OAS). It is the responsibility of the student to register with OAS. Please note that accommodations are not retroactive and that disability accommodations are not provided until an accommodation letter has been processed.

Students who registered with OAS and have a letter outlining their academic accommodations are strongly encouraged to coordinate a meeting time with me to discuss a protocol to implement the accommodations as needed throughout the semester. This meeting should occur as early in the semester as possible.
Honor Code

You are bound by Emory University's Student Honor and Conduct Code. RSPH requires that all material submitted by a student fulfilling his or her academic course of study must be the original work of the student. Violations of academic honor include any action by a student indicating dishonesty or a lack of integrity in academic ethics. Academic dishonesty refers to cheating, plagiarizing, assisting other students without authorization, lying, tampering, or stealing in performing any academic work, and will not be tolerated under any circumstances.

The RSPH Honor Code states: “Plagiarism is the act of presenting as one’s own work the expression, words, or ideas of another person whether published or unpublished (including the work of another student). A writer’s work should be regarded as his/her own property.” (http://www.sph.emory.edu/cms/current_students/enrollment_services/honor_code.html)

COURSE STRUCTURE

Class Time: Thursday 9 am – 10:50 am

Class Location: GIS computer lab in Math and Science Center Library (E301A)

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. Students are encouraged to bring a high-speed (USB 2.0 or 3.0) external hard drive (> 250GB in capacity).

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/17</td>
<td>Course Introduction, concept of remote sensing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HW 1: ArcGIS refresher</td>
</tr>
<tr>
<td>2</td>
<td>1/24</td>
<td>HW 1 report due before class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>History of satellite remote sensing, remote sensing system</td>
</tr>
<tr>
<td>3</td>
<td>1/31</td>
<td>Terminology of satellite remote sensing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lab 1: Exploring Landsat imagery with ArcGIS</td>
</tr>
<tr>
<td>4</td>
<td>2/7</td>
<td>Case study: Vegetation Reclamation on Surface Mines in Appalachia – introduction</td>
</tr>
<tr>
<td>5</td>
<td>2/14</td>
<td>Lab 1 report due before class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Case study: Vegetation Reclamation on Surface Mines in Appalachia - data and methods</td>
</tr>
<tr>
<td>6</td>
<td>2/21</td>
<td>Case study: Vegetation Reclamation on Surface Mines in Appalachia – supervised Classification, results and discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paper critique assignment</td>
</tr>
<tr>
<td>7</td>
<td>2/28</td>
<td>Introduction to atmospheric remote sensing: theories</td>
</tr>
<tr>
<td>8</td>
<td>3/7</td>
<td>Atmospheric remote sensing technology and data products</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>3/14</td>
<td>Spring break</td>
<td></td>
</tr>
</tbody>
</table>
| 3/21 | Lab 2 report due before class  
Introduction to MODIS and VIIRS  
HW 2: MODIS and OMI data access using NASA data portals |
| 3/28 | HW 2 due before class  
Case study: State Line Power Plant Closure: Effects on air quality of Chicago – introduction, data, methods |
| 4/4  | Paper critique report due before class  
Case study: State Line Power Plant Closure: Effects on air quality of Chicago – results and discussion |
| 4/11 | HW 3: Analysis of the 2003 European heat wave with NEO |
| 4/18 | HW 3 due before class  
Remote sensing for water resources management and water quality  
Lab 3: GIOVANNI exercise on Lake Erie water quality |
| 4/25 | Lab 3 report due before class  
Additional geospatial data products (ASTER GDEM) |
| 5/2  | Individual appointment with instructor for final grade |