PPHA 39911 - Environmental Analysis Methods II – Winter 2018

Head Instructor: Leroy J. Walston Jr.

Instructors:

- Geographic Information System (GIS): Leroy Walston
- Hydrologic processes (energy-water-food nexus): Eugene Yan
- Groundwater modeling and contaminated site characterization: John Quinn

Office: TBD

Student Hours: TBD

Office Phone: 630-252-3270

Email: lwalston@uchicago.edu eyan@anl.gov quinnj@uchicago.edu

TA: n/a

Course website: Course reading material will be posted online 2 weeks before lessons start.

Course Description: The course objective is to continue the introduction of analytical approaches and methods of environmental analysis started in the Environmental Analysis Methods 1 Course. This course will provide an introduction to the use of geographic information systems applied to environmental analysis and decision making, an overview of the science related to water resources and contaminated site characterization, and the methodologies for the analysis of human-water interactions (e.g., energy-water-food nexus).

Course Requirements: The course has three requirements: participation, homework assignments, and the development of an individual project that includes focus areas of the course.

- Participation – Attendance and participation to all classes is required
- Homework assignments – There will be 3 homework assignments in the course.
- Course Project – Each student will develop an individual project for the duration of the course.

Exams: There will be a midterm exam where students will report on the progress on their individual project, and a final exam in the form of a formal presentation of project results and a project report.

Course Materials: There are a number of environmental science text books that discuss the various problems addressed in the classes, but no single text book will cover all these issues. Reading and studying materials are provided in the table below. Further reading materials will be identified as classroom material is developed.

Grades: Homework assignments: 35%; Project selection: 5%; Midterm: 20%; Final project deliverable and presentation: 35%; Participation: 5%. To appeal a grade, provide reasoning in writing via email to the Instructor(s), within one week of grading.

Course Schedule: Tuesdays and Thursdays 1:30-2:50 pm; Room 224

Date	Content	Instructor	Reading/Studying Materials
Lesson 1* 1/4/18	Recap of Environmental Analysis Methods Course 1, Introduction to Course 2, and Overview of course projects	Walston	High level course overview and introduction of the course project topics. Instructor will also introduce course projects.
Lesson 2 1/9/18	Introduction to GIS. Fundamental GIS concepts such as terminology, data formats and sources, coordinate systems and projections, and spatial data visualization.	Walston	Geospatial data and exercises for hands on GIS training will be provided. Suggested reading: http://www.gislounge.com/gis-essentials/
Lesson 3 1/11/18	GIS hands-on lab	Walston	As determined in Lesson 1 and 2, this lesson will either be held in the Harris computer lab or students will need to bring laptop computers to remotely access Harris School's computer lab and ArcGIS software. **Homework Assignment #1**
Lesson 4 1/16/18	Overview of GIS applied to environmental analyses: Will present real-world examples of GIS analyses from various environmental projects. Analyses will focus on a variety of common impact categories and includes examples of applied approaches in environmental assessment, such as web-based mapping tools.	Walston	Geospatial data and exercises for GIS training will be provided. Suggested reading: http://www.esri.com/news/arcuser/0312/improving-landscape-level-environmental-impact-evaluations.html
Lesson 5 1/18/18	GIS applied to environmental decision making: Examples of how GIS has been used to inform environmental decisions in the context of NEPA, CERCLA, and risk assessments.	Walston	Suggested Reading: Use of statistical and GIS techniques to assess and predict concentrations of heavy metals in soils of Lahore City, Pakistan Modeling Fire Susceptibility to Delineate Wildland–Urban Interface for Municipal-Scale Fire Risk Management
Lesson 6 1/23/18	Overview of Spatial Models: GIS applied to ecological modeling and landscape assessment	Walston	Suggested Reading: A general model to quantify ecological integrity for landscape assessments and US application
Lesson 7 1/25/18	Map making and cartography	Walston	

Lesson 8 1/30/18	Mid-term exam	Walston	Students hand in their project drafts-open floor, sharing of results and troubleshooting.
Lesson 9 2/1/18	Water resources and budgets including shortages and excesses in the world and US. Hydrological cycle and processes, renewable and non-renewable water. Water resource planning and management. Overview of some GIS examples to analyze and visualize hydrologic system and key components as well as methods to be used for the given exercise datasets	Yan	Exercise datasets will be provided for selected areas and will be analyzed using GIS to (1) generate watersheds and major land use and cover types, (2) estimate key hydrologic components: precipitation, evapotranspiration, and runoff, and (3) visualize spatial and temporal variations of the hydrologic components.
Lesson 10 2/6/18	Climate change impacts on water resources and hydrological cycles. Methods to analyze climate and hydrologic extremes and trend. Overview of GIS examples to analyze and visualize climate and hydrologic extremes as well as their impacts.	Yan	Exercise climate dataset for Houston area will be provided to analyze whether the trend of precipitation extreme are present and visualize the results with GIS.
Lesson 11 2/8/18	Climate and hydrologic analyses with GIS – hand-on lab	Yan	The hands on training will be provided using datasets provided in the previous two lessons (lessons 9 and 10) **Homework Assignment #2A**
Lesson 12 2/13/18	Water-energy-food nexus and sustainability assessment. Overview of current methods and assessment tools (hydropower, thermal power, biofuel and food).	Yan	Suggested Reading: DOE energy-water nexus report (2014) Exercise datasets will be provided to project future water for the key sectors with GIS and selected method.
Lesson 13 2/15/18	Overview of examples using hydrologic modeling and other related tools to evaluate impacts of water and electricity demands, increase in riverine thermal regimes, and landuse change for food and bioenergy on energy development and water quantity/quality.	Yan	Suggested Reading: Impacts on thermal power generation Impacts on water quality and quantity

Lesson 14 2/20/18	Overview of project examples using SWAT model for various scenarios including water and electricity demand projections, landuse change, riverine thermal regime change, urbanization.	Yan	Hands on training to developed a SWAT model using datasets in lessons 9-12 **Homework Assignment #2B**
Lesson 15 2/22/18	Water resources system monitoring, analysis and management, global (satellite) to site scale.	Quinn	Material on groundwater modeling methods to be provided to students for homework assignment. **Homework Assignment #3A**
Lesson 16 2/27/18	Continued.	Quinn	
Lesson 17 3/1/18	Environmental water quality, remediation and policy.	Quinn	NYTimes, 11/22/14, The Downside of the Boom, http://www.nytimes.com/interactive/2014/11/23/us/north-dakota-oil-boom-downside.html?action=click&contentCollection=Energy%20%26%20Environment%20&module=MostEmailed&version=Full&region=Marginalia&src=me&pgtype=article&_r=1
Lesson 18 3/6/18	Discuss site characterization and remediation technology.	Quinn	Site characterization data set and GIS files to be provided to students for site assessment modeling homework assignment. **Homework Assignment #3B**
Lesson 19 3/8/18	Continued.	Quinn	
Lesson 20 3/13/18	Preparation for course projects	Walston (additional instructors may also join)	Course review and open discussion on course projects.
Lesson 21 3/15/18	Finals (Part 1): Course project final report due and presentations from students	Walston (additional instructors may also join)	Students give presentations (10 min) on course projects. Room: 224 (1:30 – 3:30 PM)