Spring 2019   Advanced Environmental Geomatics 11:573:462

Case Study: Raritan River Hydrological Observatory

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course website on sakai.rutgers.edu

The class will examine issues related to establishing a hydrologic observation system for the Raritan river watershed that includes real-time in situ sensing systems coupled with remotely sensed imaging and spatially distributed flood inundation modeling. The class will strengthen project planning/implementation and written/oral/graphic/web communication skills

Course Meets Fridays 9:15-12:15 pm in ENR 237

Class Goals and objectives:

Given an open-ended problem, it is the course's goal that students will be expected to:

1) Identify components of a spatial problem;
2) Develop a proposal that identifies the analytical approaches, tools, data, etc. needed to address the spatial problem;
3) Be able to execute an acceptable solution;
4) Be able to evaluate the results and assess how to improve the outcome in the future.

Class format:

The class will be taught in a practicum format with an emphasis on student-driven learning through practical hands-on individual and group projects. The class will culminate in a web-based product and a public presentation of the results to a larger audience of students, faculty and staff.

<u>Course Work/Grading</u>:

<u>Individual Project 1: Story Maps.</u> Each student will develop a story map based on State of the Raritan Vol 1 & 2. **Due date: Feb 8**

<u>Individual Project 2: Calibrating and running Flood Inundation Model</u>. Each student will be responsible for developing a flood inundation model using ArcModelBuilder and the HAND methodology. **Due date: Feb 22**

<u>Group Project 3: Drone Image Processing and Analysis.</u> Students will work in small groups to process and visualize drone imagery of the RU EcoPreserve. **Due date: Mar 8**

<u>Annotated Bibliography and Literature Review.</u> Each student will develop an annotated bibliography based on a topic selected from the UCGIS Body of Knowledge. https://www.ucgis.org/gis-t-body-of-knowledge **Due date: March 15**

<u>Team Project.</u> Each student will participate in one team project. **Due Date: May 9**

> **<u>1. Visualizing and Analysis of Ground-based LiDAR.</u>** Each student will be responsible for integrating and extracting information from a LiDAR data set collected via boat on the Raritan River.
>
> **<u>2: Collect water quality data using underwater drone or in situ sensors.</u>** Deploy underwater drone to acquire data of Raritan River in New Brunswick area.
>
> **<u>3: NJFloodMapper</u>**. Pilot the development of real-time flood inundation application for NJFloodMapper.
>
> **<u>4:</u> RRRTHO web page.** Design and develop an interactive web application for the Raritan River Hydrological Observatory (RRRTHO).

Deliverables:

1) Individual/group project reports outlining objectives, methods, and results.
2) Completed geospatial model/analysis outputs including documentation
3) Final report on class project in both hard-copy and web-based format
4) Public Presentation
5) Self-critique of your contributions to group and class projects

Course Expectations: In addition to completing the skills-building assignments, I expect that the class will undertake a rigorous investigation of the issues surrounding hydrological monitoring and spatially distributed watershed modeling. As a tangible outcome of the course, I expect the class to develop a professional quality web-based report and public presentation.

I also expect that the students in the class will contribute not only to the course work, but also to the course itself. Specifically, students should participate actively in class discussions and decisions and provide guidance throughout the semester for the selection of speakers and topics.

<u>Tentative Schedule</u>

Since the students are asked to help design the process and agenda for the semester, it is expected that THIS SCHEDULE WILL CHANGE.

January 25	Class logistics & Lecture: State of the Raritan In-Class Workshop: Story Maps https://learn.arcgis.com/en/projects/get-started-with-story-maps/
Feb 1	Basics of Watershed Modeling & ArcHydro Tools In-Class Workshop: Flood Inundation Modeling
Feb 8	In-Class Workday: Flood Inundation Modeling
Feb 15	In-Class Workday: Flood Inundation Modeling
Feb 22	Photogrammetry using a Structure from Motion approach In-Class Workshop: Image processing of drone imagery
Mar 1	In-Class WorkDay: Image processing of drone imagery
Mar 8	In-Class WorkDay: Image processing of drone imagery
March 15	Discuss Class/Team Project
Mar 22	Spring Break
Mar 29	Class Project Work Day: Finalize topics and teams
Mar 30	Boat trip on Raritan: Meet at Class of 1912 Boat House
Apr 5	Class Project Work Day
Apr 12	Class Project Work Day
Apr 19	Class Project Work Day
Apr 26	Class Project Work Day
May 3	Class Project Work Day
May 9	Final Presentation (1pm)

Readings: The following is an initial list of readings with due date.

<u>January 25</u>

McKibben. 2016. Smartest Lake on Earth Adirondack Life. 36-41.

StoryMaps https://storymaps.arcgis.com/en/how-to/

Storytelling with Maps: Workflows and Best Practices
https://www.esri.com/arcgis-blog/products/story-maps/mapping/how-to-make-a-story-map/

StoryMap App templates https://storymaps.arcgis.com/en/app-list/

http://storymaps.esri.com/downloads/Building%20Story%20Maps.pdf

https://storymaps.arcgis.com/en/resources/

February 1

Zheng, X., D. G. Tarboton, D. R. Maidment, Y. Y. Liu and P. Passalacqua, (2018), "River channel geometry and rating curve estimation using height about the nearest drainage," Journal of the American Water Resources Association. https://www.onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12661

Liu, Y. Y., D. R. Maidment, D. G. Tarboton, X. Zheng and S. Wang, (2018), "A cybergis integration and computation framework for high-resolution continental-scale flood inundation mapping," Journal of the American Water Resources Association. https://www.onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12660

https://www.weather.gov/media/wrn/calendar/ConvertingWaterInformationintoActionableWaterIntelligence.pdf

February 15

Colomina, I., and P.Molina. 2014. Unmanned aerial systems for photogrammetry and remote sensing: A review. ISPRS Photogrammetry and Remote Sensing 92:79-97. https://www.sciencedirect.com/science/article/pii/S0924271614000501

A Beginner's Guide to Drone Mapping Software
https://www.dronepilotgroundschool.com/drone-mapping-software/

Other resources

Building Models for GIS Analysis Using ArcGIS 10
https://www.esri.com/training/catalog/57630437851d31e02a43f219/building-models-for-gis-analysis-using-arcgis/#!

http://www.geography-site.co.uk/pages/skills/fieldwork/fluvial/cross.html

https://waterwatch.usgs.gov/wqwatch/map?state=nj&pcode=00010

https://water.usgs.gov/osw/flood_inundation/science/index.html